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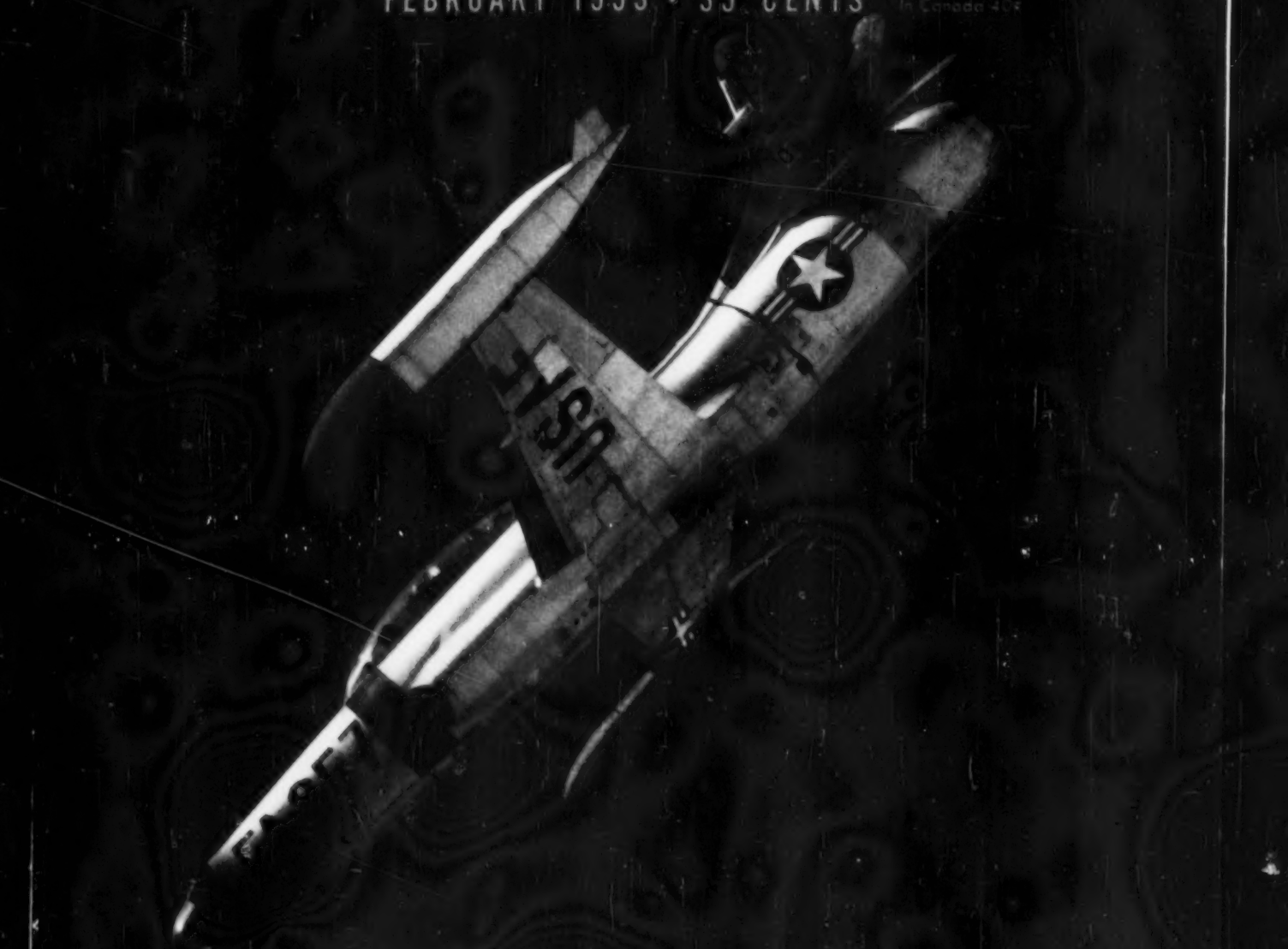

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(CUB TO PANTHER)

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MAIL BOX

CONCERNING KITS

I'm writing to put my two cents worth in on the problem of airplanes in kit form. I am all for it and as soon as one comes on the market they have a customer. The boat industry has shown that people will buy things in kit form. And what kid hasn't built a model airplane? I believe that the enthusiasm of building model planes will carry through to the real thing.

If one were put on the market at a reasonable price, I'll bet I could sell a dozen in a minute just at the local airport.

KONRAD H. MUNSON

New Lebanon, Ohio.

I thoroughly agree with Mail Box letters asking for kitted, cheap, low and slow airplanes—especially after reading "Old Enough to Vote" (FLYING, December.)

GEORGE T. BERTAN

Rialto, Calif.

Most interesting to me was "Let's Give Aviation Back to the People" (FLYING, August) on home builder kits.

I've jumped the gun, for I have my own design three-fourths finished and my little plane should do around 200 mph on a C. 85 engine. Approximate weight is 800 lbs. I'm trying to create interest around here on home-built kits that fit the little pocketbook.

JAMES ISTVANICK

Wilmerding, Pa.

"Old Enough to Vote" sure brought back memories of the good old days of flying. I learned to fly in a two-cylinder Aeronca "K" that I still have sitting next to my Piper *Cruiser*. I retired it in 1938. It still is flyable but not licensed.

I also am for simple airplanes in kit form. As a teacher of aeronautics in our local high school, I know that many of my students would be interested in building and flying an economical airplane. These young people would like to fly for the enjoyment and satisfaction they would get out of it. In building their own airplanes they would also understand what makes them fly. I am for the "cheap, low and slow" airplane to put our young people back in the flying game where they belong.

LLOYD S. HEBERLE

Townsend, Montana

I want to endorse Charles Burton's article on home built kits ("Let's Give Aviation Back to the People"). The entire idea is sound. I helped build an "Air Camper" when I was 13 years old in the days when private flying belonged to private pilots.

At present a large percentage of repairs, both minor and major, are performed by the owner and inspected and signed for by the A & E. The owner could just as easily assemble a kit and have it inspected by a designated inspector.

I have a welding and fabricating shop and over the years I have done much specialized welding on air-frames and alloy metal for A & E mechanics and flying services. The reason I was called in is because most A & E mechanics are not expert welders and have the good sense to realize it. Yet I am not allowed to build my own ship or even assemble a kit without government approval. There must be thousands of individuals who have the skill and experience to build a plane from scratch if furnished with a set of working plans. Many times more could assemble a kit. Let's hear more about CAA-certified kits for single seat up to four-place planes.

FRED A. ARNOLD

Lake Charles, Louisiana

BABY JODEL

For the many readers who have expressed special interest in lightplanes which may be home built, FLYING is happy to report the latest information received concerning the "Baby Jodel," a tiny plane that is popular with private pilots in France.

German Volkswagen car motors are used to power the little aircraft. The air-cooled automobile motor has been found satisfactory for lightplane use.

The French designer, Jodel, builds the plane to which he has given his name on the assembly line of a small factory near Dijon, France. He also sells, for $14, the blueprints which enable individuals and clubs to build their own planes. The costs range from $690 to $925.

Here are some of the details of the "Baby Jodel": fuselage and wings of wood; wingspread, 23 feet; length, 17 feet; weight, 319 lbs.; maximum speed, 90 mph; cruising speed, 68 mph; fuel consumption, 1.3 to 1.6 gallons per hour.

This information comes from Edward C. Martin of O'Brien Advertising Ltd., 928 West Pender Street, Vancouver 1, British Columbia, Canada. Further details may be obtained from him.

AEROBATIC BOOSTER

I am a collector of photographs of famous aerobatic teams and I possess already many aerial pictures of the world-famous Skyblazers. Further, I have pictures of the Acrojets and several Canadian, French, British and Dutch stunting teams.

The Dutch Government Civil Flying School possesses a Harvard aerobatic team which is famous in Europe and already three times has won stunting exhibitions. They are very good, for the British are saying they are the best formation in Europe.

Wim Nagtegaal

I am sending a photograph of my three-year-old son in a Harvard trainer. He got his first ride in this plane just a couple of weeks ago. His name is Wim, Billy in English, and he is not afraid to fly.

A. J. NAGTEGAAL, JR.

Leist, Holland

PAT-ON-THE-BACK

While your contributors are giving a few well deserved kicks-in-the-teeth to various big town airports, could I give an equally well deserved pat-on-the-back to the Tulsa, Oklahoma, Municipal Airport?

The solo cross-country student in his 40 horse J-3 gets the same friendly attention as Joe Moneybags with his four-engine custom built strato-super. If he's number one to land or take off, he's number one. The tower crew is well trained, efficient, courteous and accommodating. They give well defined light signals to radio-less aircraft and complete instructions that are easily understood to craft with radio. No mumbling or sing-song folderol that is so hard to understand or translate.

The ground crew meets you at the ramp with plainly executed signals and they treat you like you had been invited in for Thanksgiving Dinner. A motor scooter is on hand to take you and luggage to the terminal and it meets you at the gate when you are ready to leave.

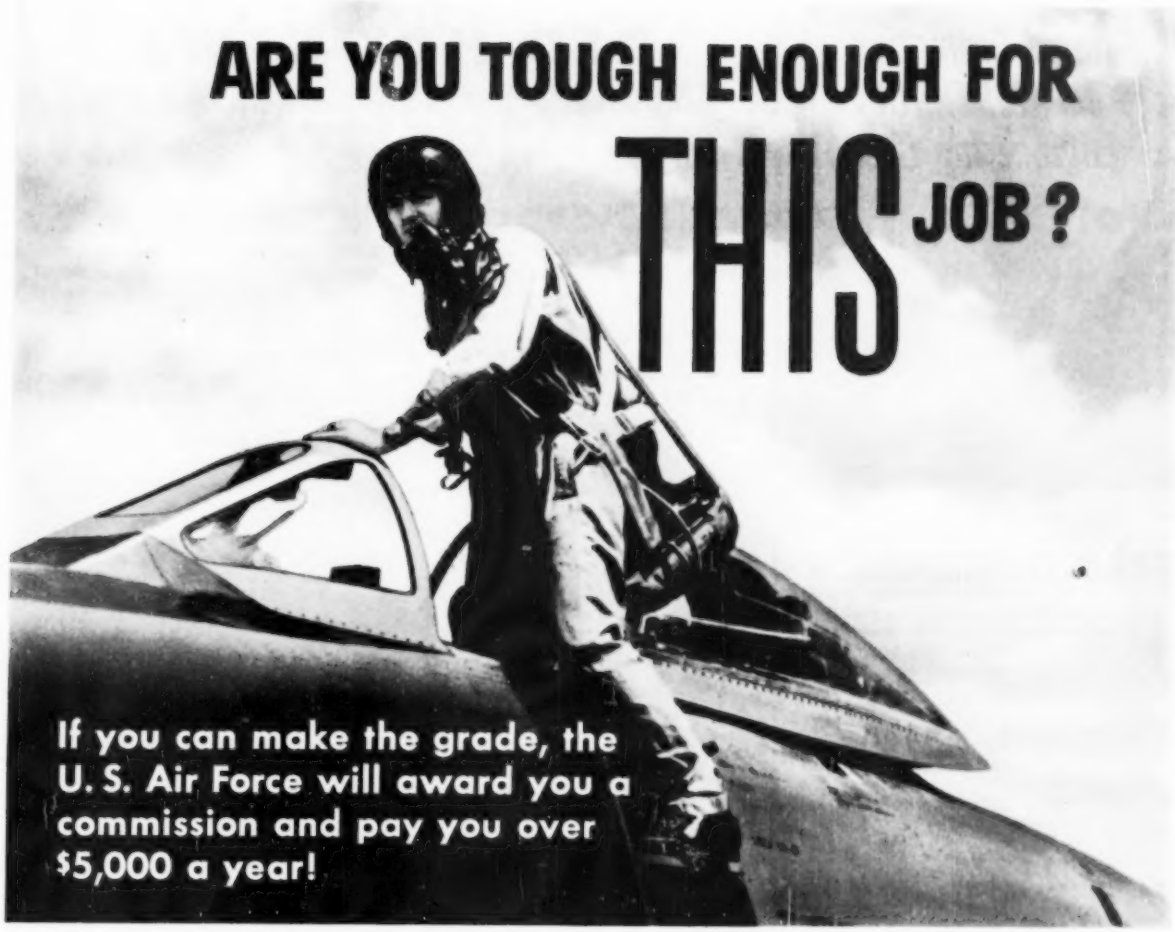
Although Tulsa is one of the nation's busy airports, you can stop and gas there in less time than you can on most small airports that have little business. It is really refreshing to see how big-town airports can treat the little guy if they want to. By the way, Tulsa airport has always used black ink on its books. Maybe there's a reason.

LOREN CARLBERG

Enid, Oklahoma

● FLYING *always lends a sympathetic ear to the gripes, but is* delighted *to pass along that rarer thing, the compliment.* —ED.

ARE YOU TOUGH ENOUGH FOR THIS JOB?



CAN YOU "take it" 6 days a week? For 52 weeks? Can you meet the high standards required to be an Aviation Cadet? If you can—then here's the chance of a lifetime! An opportunity to serve your country and build a personal career that will fit you for responsible positions both in military and commercial aviation.

It won't be easy! Training discipline for Aviation Cadets is rigid. You'll work hard, study hard, play hard—especially for the first few weeks. But when it's over, you'll be a pro—with a career ahead of you that will take you as far as you want to go. You graduate as a 2nd Lieutenant in the Air Force, with pay of $5,300.00 a year. And this is only the beginning—your opportunities for advancement are unlimited.

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To qualify as an Aviation Cadet, you must have completed *at least* two years of college. In addition, you must be between 19 and 26½ years, unmarried, and in good physical condition.

YOU CAN CHOOSE BETWEEN PILOT OR AIRCRAFT OBSERVER

If you choose to be an Aircraft Observer, your training will be in Navigation, Bombardment, Radar Operation or Aircraft Performance Engineering.

New Aviation Cadet Training Classes Begin Every Six Weeks!

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2. If application is accepted, the Air Force will arrange for you to take a physical examination at government expense.
3. Next, you will be given a written and manual aptitude test.
4. If you pass your physical and other tests, you will be scheduled for an Aviation Cadet Training Class. The Selective Service Act allows you a four-month deferment while waiting class assignment.

U.S. AIR FORCE

Where to get more details:

Visit your nearest Air Force Base or Air Force Recruiting Officer. Or write to: Aviation Cadet Headquarters, U. S. Air Force, Washington 25, D. C.

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RED HOT NEWS

(Ed. note—Data here presented comes from patriots behind the Curtain. They know aviation and are reliable. However, they work under great stress, and possibility of error must always be considered. Data is original. Some items must be withheld for pertinent reasons.)

A-BOMB IN THE ARCTIC

Headed by the escaped British physicist, Prof. Pontecorvo, a secret Russian expedition is reported on its way to the Arctic. The expedition involves a major air-lift from Siberian bases to transport its equipment to the main camp somewhere within the arctic circle. Observers believe that a nuclear bomb will be set off under ice to open new shipping lanes.

AIRCRAFT INDUSTRY

Staffed exclusively by the Chinese, a new factory manufacturing an unidentified transport aircraft has been reported near Harbin. The plant took over the overhaul and repair of Soviet aircraft engaged in the air-lift to China operation.

AIRBORNE PERISCOPE

In anticipation of frictional heat high enough to melt glass, the Red experimental delta aircraft is reputedly equipped with a self contained, retractable cockpit. When certain high speed is reached, the cockpit enclosure folds into the fuselage and the flight continues on instruments. The only outside visual reference is provided by means of a periscopic mirror arrangement. On several occasions, the delta has been seen taking off and landing with the cockpit fully retracted which would indicate that the periscope provides satisfactory vision. The delta aircraft of unknown designation has been seen at Kutchino air base.

SABOTAGE?

Thirteen fatal accidents involving military aircraft have been officially reported in Soviet-occupied Germany as due to pilot negligence where enough evidence was available to prove structural failure. These accidents occurred within three weeks and involved aircraft just back from overhaul bases.

RUSSIANS IN KOREA

Two officers from every Russian squadron are requested to volunteer for duty in Korea as "military observers." The tour of duty is 30 days and the rotation is strictly observed. One of the officers back from the Korean front has been overheard to say that secret orders circulated among the Russian flying personnel advised engaging in combat only if there was no doubt about the element of surprise or numerical superiority over the U.N. planes.

HASTE MAKES WASTE

Patterned after the Soviet system, mandatory competition among workers has been introduced in the Polish aircraft industry as means of stimulating productivity. But according to recent reports, the ever increasing norms of work force the workers to sabotage and last year's production figures are lower than the year before. Factories and workshops display a special board adorned with a cartoon of an ass. Names of workers who did not meet the exorbitant norms are posted there every week with either a letter or a crude poem ridiculing the lagging men.

CHILD LABOR

Almost 350,000 youngsters of both sexes are conscripted into the Polish aircraft industry every year. Sanctioned by the Youth Employment and Vocational Training Act of September 1951, 14 year olds are forced into *Sluzba Polsce*—a government youth organization where they undergo basic military training, industrial and political indoctrination. Groups of youngsters are "detached" to particular factories where they work under the same rules as the adult labor: 10-hour day and 60-hour week. Although official reports praise the youngsters' 100 per cent efficiency, the real figure is estimated at 35 per cent.

ROCKETS

Manufacture of ground-to-ground and ground-to-air rockets for the Red army has been farmed out to satellite industries in Poland, Czechoslovakia and now Hungary. Hungarian workers declared their "eagerness" to help the Soviet Union and began work in the semi-finished plant at Cinkota near Budapest.

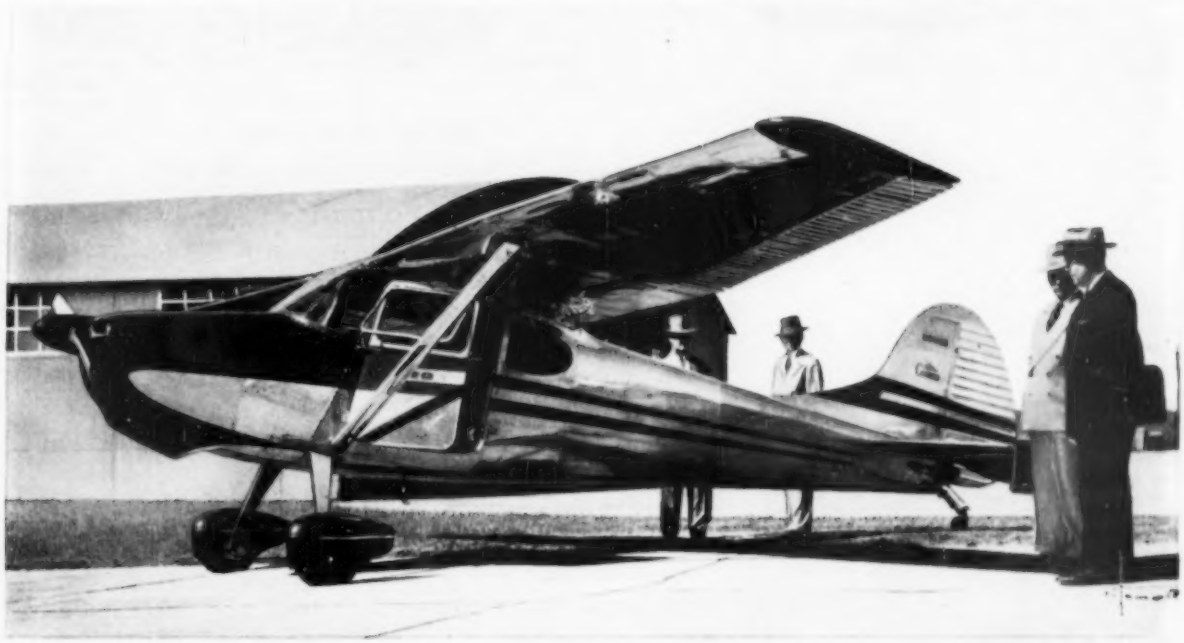
Old rocket launchers mounted on truck chassis have been revamped and are now capable of vertical elevation and firing at air targets. A new type of launcher with very short rails has been seen in transit in Poland.

Originally thought to be new supersonic wing tanks, air-to-air rockets are now carried by MIG-15s. Fifteen-foot long missiles are fired as soon as the target is sighted whereupon the rockets guide themselves toward the target. Several trial runs have been observed where the rocket hit the target drone without exploding, popped open small parachutes and floated to the ground. Monitoring of the rockets by the launching aircraft is unlikely, since the fighter made 180° turn and left the scene of interception as soon as the rockets were fired.

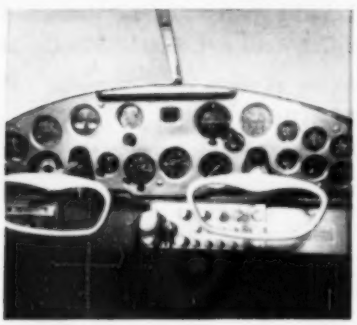
CESSNA UNVEILS

NEW "GOLDEN YEAR" MODEL

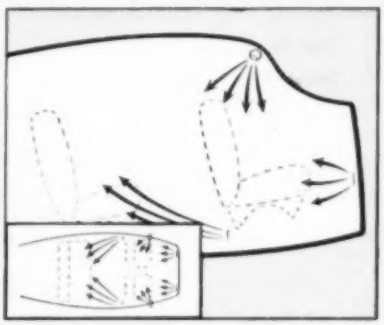
of America's Largest-Selling Private Plane



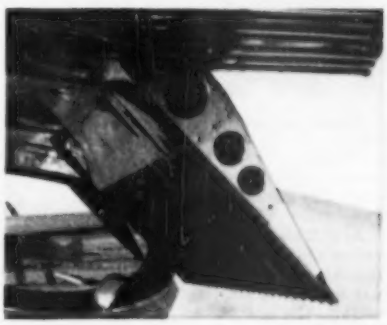
THE NEW ALL-METAL CESSNA 170! The plane businessmen found *the most* practical for their business needs in 1952...new and greatly improved for flying's anniversary year! The finest 170 ever built to save hours, increase efficiency, earn more profits for you!



NEW BEAUTY! Completely redesigned instrument panel. Easier to read. Blends with beautiful new interiors.



NEW COMFORT! Completely new heating and ventilating system for "living room" comfort at any season, any altitude.



EXCLUSIVE safety features! "Para-Lift" flaps, for example, reduce landing speed 10%, give *quick* added lift out of short fields.

• The Best from 50 Years of Aviation Progress in One Completely Practical Low-Priced Plane!

In 1903, the Wright Brothers made their first flight. And now—for 1953, the "Golden Year of Flying"—Cessna launches the first of its "Golden Year" airplanes, the new Cessna 170!

The best from 50 years of flying—the best from Cessna's own 42-year history—have gone into this airplane. Proved *and improved* through daily use by thousands of business firms, the Cessna 170 is already—deservedly—America's largest-selling business airplane. And now it's better than ever!

The "Golden Year" Cessna 170 is new in appearance, new in performance, new in comfort and safety. All of the new features can't possibly be listed here—but if you, like so many other businessmen, feel that there is a place for an airplane in your business, see the new low priced all-metal Cessna 170 at your Cessna Dealer. He is listed in the yellow pages of your phone book. Or write: Cessna Aircraft Company, Dept. 91, Wichita, Kansas.

FLYING's FAMILY

From Port Lavace, Texas, Ruel McDaniel (See "Shrimplift," p. 17) writes somewhat smugly: "I'm a native Texan who managed to tear myself away from the Lone Star State long enough to see quite a bit of the rest of the country, found nothing to replace Texas, and came back.

RUEL McDANIEL

"My interest in aviation started in 1917, when some fellow with gold stripes talked to a battalion of rookie sailors at Newport and said he wanted volunteers to be aviation mechanics and quartermasters. I volunteered.

"I was not long in learning that a quartermaster's duties consisted mainly of 'beach-muling' so I saw to it that I was tagged for cadet training at MIT. I got my wings at Pensacola as Naval Aviator 2434 about the time World War I ended.

"In the Navy I distinguished myself by flying into a lighthouse tower while tormenting fishermen in Pensacola Bay. I remained in the Navy as instructor at Pensacola, then went back to a budding newspaper career that was interrupted by the war."

Since then McDaniel has worked as school teacher, ranch hand, reporter, editor, free-lance writer and publisher. For five years he was publisher of business magazines, including "Seafood Business." He recently sold his publishing interests and returned to free lance writing.

* * *

Above you see three good reasons why Major John C. Riley, USMCR (See "Cub to Panther," p. 14) considered that "orders to Stateside are like orders to Heaven"—his wife Edie, son Jerry, and daughter Pam.

At FLYING presstime, Maj. Riley had received orders to report to the Second Marine Air Wing at Cherry Point, N. C., and was hoping for jet duty. Is he still a Reserve? Oh, yes, a Reserve On Extended Active Duty.

THE COVER: Lockheed F-94C Starfire.

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EASY STREET – 1953

While you're making resolutions for the new year, here's one that's bound to broaden your horizons. Resolve to travel the broad blue *high* way TWA Skyliners fly. It can be your road to greater success in business; your pathway to greater pleasure during vacation days ahead. Swift, dependable TWA Skyliners can help you *see more* and *do more* no matter where in the world you go.

Where in the world do you want to go? For information and reservations, call TWA or see your travel agent.

ACROSS THE U.S. AND OVERSEAS... FLY **TWA**

TRANS WORLD AIRLINES

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FLYING
VOLUME 52, NO. 2
FEBRUARY, 1953

AN EDITORIAL

CLEARING AHEAD

THE skies of 1953 are dotted with thunderheads and the destination of world peace still lies far ahead.

On the other hand the people have regained control of their ship of state. She rides easier to the feel of the average man.

Against this background we may appraise the stature and requirements of American aviation.

But first we may note that the United States is no longer alone in free skies. Britain is well aloft with a technically modern fighter force geared to her defense. In any dawn she might throw a thousand jet interceptors above the Channel. And her night bomber force, in which the RAF has vast experience, grows apace.

Additionally the NATO air forces of France, Belgium, Holland and other allies are rapidly taking on stature. These modern squadrons cannot be swept easily aside as were their predecessors by the Luftwaffe.

Notable in preventing wholesale Soviet onslaught are our strategic, tactical and logistic squadrons based on a hundred far-flung fields outside continental limits. Fed from the products of some 180 training and operational air bases within the country, these global sentries are the first line of defense. Their attrition in case of war would be swift but their punishment of an aggressor would be without parallel.

Here at home where the roots of air power must be cultivated, the husbandry is improving, if not yet perfect. The lost years of research and development can never be recaptured, but at enormous cost and exhausting effort our technical position is being retrieved.

Around the plants one notes an increasing amount of ultra-modern machine tooling. Engineering is still at a premium but on-the-job training is speeding up the experience level of the industry. Among sub-contractors the men are being divided from the boys. Certain notable component parts manufacturers are winning fresh respect. In other cases the prime contractors are getting critical parts production back into their own hands. Paper work is a vast consumer of man hours.

Probably the most productive stimulant to the industry would be a revision of fiscal policies. One marks throughout industry ranks a chafing at the bit as in the case of a horse over-controlled by an amateur rider. The effect is to dampen incentive. A new national administration might well look into this matter. Any business must have a clear mirror of its prospects if it is to be effective. The patience of the aircraft industry under prevailing circumstances has been strained beyond reason.

In the field of air transport, the situation has never been more promising. Throughout the past year both the load factor and the safety record have been gratifying. Airline fleets are at a new high in carrying capacity and several airlines have paid in taxes two or three times what they received in mail pay. Among all forms of transportation, the airlines have maintained the lowest percentage of tariff increase.

And last but not least . . . the field of personal plane activity is attaining maturity beyond any previous level. True, the manufacturer's market is largely in the realm of agriculture and business where use of personal aircraft can be justified as a business item. But has not our prime objective always been to stabilize personal transportation at the business level? At aircraft distributors' and dealers' meetings, at local operators' conventions and around an increasing number of airports one notes more and more of a business attitude.

Corollary effect will be renewed zest for flight training at community level. The kids will come back. There will be something worth coming back for.

The year 1953 will not be without its problems aloft but neither will it be without its answers . . . the best answers since the war.

Gill Robb Wilson

Gill Robb Wilson
Editor and Publisher

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High Safari

Jungles, deserts, deltas, seas and cities—all figured in the flight plan for this African odyssey.

By JOSHUA N. HALDEMAN

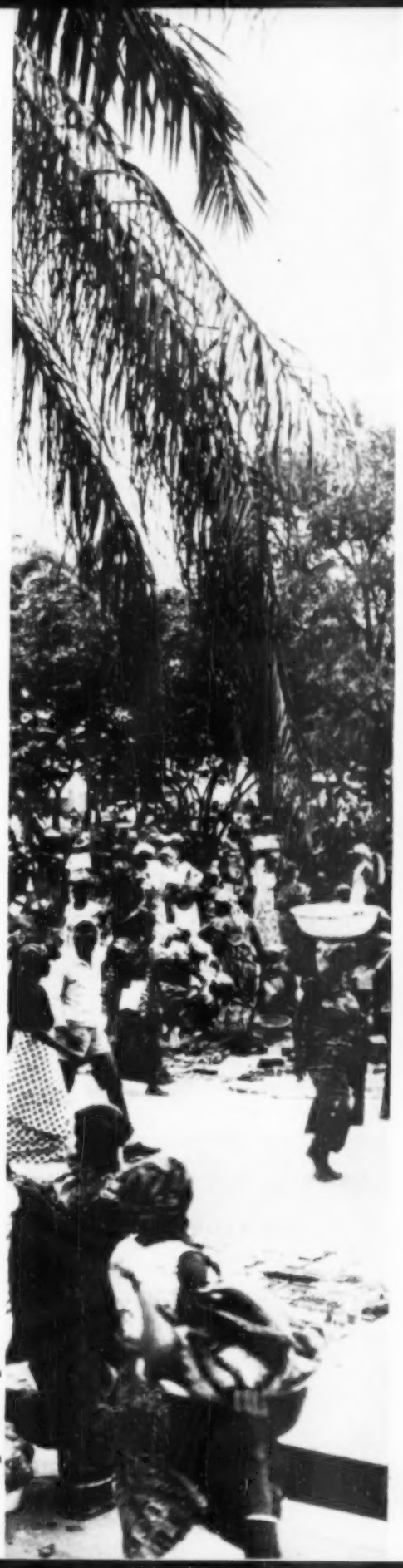
WINNIE . . . that's my wife . . . and I have been told that we are the world's most travelled couple of lightplane flyers.

We don't know about that but we believe a personal plane is for getting around, so when we can afford it we just "git up and git." Usually we take the four youngsters whose total weight at this writing is 180 pounds but sometimes we leave them in school . . . as on this last trip.

I'm a chiropractor and last spring was invited to speak at the Convention of European Chiropractors in Oslo. Oslo is a "fur piece" from South Africa where we live, but no farther than Canada, where we came from originally. So we decided to make the most of our invitation to Oslo. That's how we came to fly our little Bellanca *Cruisair* 22,000 miles in completely circling Africa and Europe . . . and that's not the longest trip we ever made in the little ship.

But since FLYING magazine asked us for a report on the Oslo jaunt, I'll stick to this one mission. We used 91 air maps, crossed 57 countries and territories and got tagged with 74 government stamps in our passports and 90 in our plane log book. We were gone six weeks.

It's our contention that if anyone has the courage to face government red tape the private airplane can bring the world within his reach. On this last trip I watched Winnie sit without batting an eyelash when we (*Continued on page* 58)



Market day in Leopoldville, picturesque capital city of the Belgian Congo.

A line of *Panther* jet fighters at a Marine Corps base in Korea is surveyed with pride by two of their Leatherneck mechanics.

Cub to Panther

By MAJOR JOHN C. RILEY
United States Marine Corps Reserve

"The more you sweat in peace, the less you bleed in war."

WHEN the Communists invaded South Korea in June, 1950, I was instructing in *Cubs* at King Airport, East Taunton, Mass. As a Marine Corps Reservist, I was then spending one weekend a month in drills with my squadron, and 15 days each year in intensive Reservist training.

In less than three months my squadron, Marine Fighter Squadron 235, was called. On September 18 we checked in at Squantum for active duty with the Fleet Marine Service. Korean service with that *Corsair*-flying squadron was not in the cards for me, however. One day the call came in for two pilots for Fighter Squadron 311, which was flying *Panther* jets. There was a hasty drawing of names and I was one of the lucky ones. I'd graduated from *Cubs* to *Panthers* in six weeks.

The ground school and before-flight lectures given me prior to my first taking a *Panther* up were thorough and left nothing to guess-work. Before getting into the

cockpit of the jet I knew more about its engine and characteristics than I ever knew about the *Corsair*, despite the fact that I had quite a bit of time in the U-bird.

After checking out in all phases of ground school, and drawing my "anti—buffet helmet" or so called "hard-hat," I was ready for the big day. That walk out to the ramp with T. C. Billings, World War II buddy of mine who was going to fly chase pilot on me for my first flight, could be likened to nothing in my memory. This was the fulfillment of all my most wildest hopes and dreams.

I really don't remember much of what happened on that first flight—guess I was just sort of numb—except that when I did get back on the deck after about an hour's flight I rushed into Operations to see when I would be scheduled for the next hop.

Flying a jet is what I had always dreamed flying should be like—no noisy engine, no endless engine gauges to go cross-eyed watching, no long waving nose protruding in front to block your vision and wrestle with when a crosswind presented itself on landing. It is only necessary to touch a lever and the canopy closes. The simple, one-throttle arrangement initiates a smooth torqueless motion of the powerful engine. With a jet there are no mixtures, prop control or blower levers to worry about. There is only the soaring free feeling which the gulls enjoy.

In November we had orders to board ship for Japan. Our mission, we were told, was to evaluate the *Panther* and to determine its potentialities as a close air support weapon.

We arrived in Korea and saw action for a few days in the all-important Marine Hungnam-Yongpo evacuation. When the evacuation had been successfully completed we moved to southwestern Korea and operated as a unit attached to the Fifth Air Force.

We had a certain amount of difficulty in evaluating the *Panther* since this type of aircraft had not been perfected at the time. However, with our engine check crews working oftentimes around the clock in sub-zero weather, we managed to maintain our availability of aircraft till we were over the hump. Once our aircraft was trouble-free, we couldn't be stopped.

Some time in February we moved north and operated from a field at Pohang alongside a Marine *Corsair* Squadron, much to our pleasure. Although the Air Force was very hospitable and cooperative, Marines are happiest when they're operating with Marines. Now we had an eager competitor in the U-birds for the delivery of rockets and bombs to the Commies.

Morale is something that I feel we never have to worry about in the Marine Corps. A Marine is born with it, raised with it and dies with it. We have our "eight balls" and our "gold brickers" but they are few and far between and I can truthfully say that never once did I hear any of my squadron buddies gripe about why they were in Korea. Many, like myself, were "retreads" but unless you looked at their record books you wouldn't know that three months before they were teaching school, pounding beats or selling machinery.

Here is the way our jet squadron stacked up with a prop-driven squadron. In June, 1951, we flew more missions, fired more rockets and 20 mm., and spent more time over the target than our neighboring *Corsair* squadron which was operating under the same combat conditions as we were. However, the *Corsair* is a World War II aircraft and at the time I left Korea was still carrying the load for the Marines hitting the Commies.

The jet as a gun platform is steady, and as stable a craft as you would want to fire from. No matter what added speed you may pick up in your run the torquing effect is nil and the amount of (*Continued on page* 51)

Riley was flying lightplanes in New England when war started in Korea.

Back on active duty with the Marines, Riley was assigned to *Panthers*.

The author, Crew Chief Dewey and J. J. O'Reilly with a captured tank.

After 100 missions each, the drinks were on "Dave" Davis and Riley.

Hotrod for jets

The lowdown on that thrust augmenter known as the afterburner.

By BRUCE SMITH

Director of Engineering, Ryan Aeronautical Co.

FOR generating sheer power, with the simplicity of an exploding bomb, it's hard to beat an afterburner. From a tube no bigger than an elongated barrel are released energies which can virtually double the thrust of the most powerful jet engine. With a ground-shaking rumble, the afterburner instantly transforms fuel into thrust for flight. It consumes fuel like a flaming oil well but shuns all major moving parts and weighs only one-fourth as much as a turbojet.

Ryan has long been interested in the field of thrust augmentation. In connection with the Ryan XF2R-2 fighter—an advance version of the XF2R-1 *Dark Shark Fireball*—Ryan was the first American manufacturer to develop an afterburner, conducting this work under Navy's Bureau of Aeronautics contract.

The XF2R-2 was designed around the *Fireball* jet-plus-propeller principle. In the nose was a General Electric TG-100 "turbo-prop" engine—a gas turbine turning a propeller. In the aft section of the fuselage was a Westinghouse 24-C jet engine incorporating a Ryan afterburner.

Today, Ryan is building afterburners and afterburner components to augment the thrust of other General Electric and Westinghouse jet engines. Even though these power plants are already more powerful than their piston engine predecessors, additional thrust is needed to zoom interceptors to 40,000 feet and give fighters lightning-like getaway. The afterburner is just the device to provide the kick in the empennage. With the same static thrust as a larger, heavier engine without the re-heat device, an afterburner-equipped plane will have twice the rate of climb, lighter weight and equal, or greater, radius of action.

For taking a wave-off from a carrier, an afterburner is a pilot's dream. With reduced throttle, a jet engine requires several seconds to develop the increased thrust necessary to accelerate an airplane away from the carrier deck. This delay could put the pilot in the drink. The afterburner goes into action with instantaneous force, taking only a second to boost the plane skyward.

Essentially a ram-jet engine hooked to the tail of a turbojet, an afterburner is a flaming tailpipe which feeds upon the unburned oxygen in the jet stream. In a conventional piston-type engine, air and fuel are mixed together in about a 16 to 1 ratio and rammed into the cylinders. In the turbojet, the air-fuel ratio is 60 to 1. About one-fourth of the air, or oxygen, is burned in the combustion chambers. The rest is used to dilute the mixture to keep temperatures down and to cool the engine's hot components. The oxygen in this unconsumed air of the jet stream supports the combustion of the afterburner.

On paper, an afterburner looks like an easy way to get big thrust dividends from a jet engine. You simply inject gallons of fuel into the jet stream, ignite them and enjoy the tremendous burst of speed which the escaping gases impart. Since the burning takes place downstream from the engine, no added thermal or mechanical stresses are imposed on the critical parts of this highly stressed power plant.

That's the way it looks at first glance. Actually, you run into a myriad of paradoxical problems as soon as you begin to get serious with an afterburner design. You never quite get rid of some of them, as a good many engi- (*Continued on page 57*)

To illustrate tremendous power needed to push planes at supersonic speeds, NACA built model at top to show hypothetical plane capable of 1,350 mph speed. Lower model shows plane capable of same speed but with engine nacelles greatly reduced in relative size because turbojet engines are now equipped with afterburners.

Sacks of iced shrimps are loaded aboard a C-54 at Vera Cruz, Mexico, to be flown to Mazatlan for washing, grading, packing and quick-freezing.

Shrimplift

Aviation is a partner in the booming shrimp industry.

By RUEL MCDANIEL

Fishermen on a Texas shrimp trawler haul in the net after a "drag."

SHRIMP production in North America has more than doubled in the past 15 years and the price of shrimp has increased about 400 per cent, making it the lustiest and fastest-growing segment of the commercial fishing industry. Today, shrimp ranks third in value among all species of commercial seafoods in the United States.

And aviation has contributed materially to this "shrimp boom."

An example of how aviation is vital to the success of the industry is the situation created last spring on Mexico's west coast. Mexico's shrimp industry was started by the Japanese back around 1930 and really developed after World War II by Mexico and California seafood men. It grew up around Guaymas, on the Gulf of California, and Mazatlan, roughly halfway between the extreme south and extreme north of the western coast. Port facilities for handling shrimp boats, ice plants for icing down the (*Continued on page* 54)

JET RIDE

A lightplane pilot comes down

By ***LOREN STOVER***

The author, CAP Captain Loren Stover (left) is briefed by Maj. Thomas T. Williams of Pinecastle AFB, Florida, prior to his ride in a T-33 jet.

Sally Wilt, a Florida CAP cadet, was given a 1 hr., 40 min., ride in a T-33. Sally looks pleased as punch while Maj. Williams does paper work.

RIDING a Lockheed T-33 Air Force jet for the first time is like slipping on a banana peel indefinitely without falling down. But I'm getting ahead of my story.

It all began when Captain Edward Kuhn, flight officer at Pinecastle jet training base in Florida, outlined procedures to Civil Air Patrol members in a meeting at Orlando. Now we were actually nearing the operations office at Pinecastle, ready to accept promised flights as civilian guests of the Air Force.

Out in front, on the great expanse of macadam aprons, T-33 trainers blew heat waves, straining to be gone from the earth.

As we watched these shining creations zoom from the runway and snort off into the morning sky, I experienced a feeling that I was peculiarly one of the earth-bound.

The commonplace matter of riding a jet can pose problems for the new passenger. Officers in charge are aware of this, and considerate. In fact, at Pinecastle, people seemed so friendly and solicitous on the ground that one had to wonder briefly whether this could be "the smile preceding the hemlock."

After introductions all around, Ernest Smith, the other lucky CAP pilot, was assigned to Major H. W. Martin and I to Captain Douglas W. Thompson, Wing Flying Safety Officer. In that connection it should be emphasized that we didn't go off into the wild blue yonder without a most thorough check of everything concerning the flight.

With necessary papers signed, I was given coveralls and instructed to get out of uniform and into the flying suit. This done, a crash helmet with oxygen mask was selected and tried and another combination of better fit chosen. Anything having to do with oxygen must fit and operate right, for if the pilot goes above 15,000 feet, oxygen can be a vital consideration.

Another officer approached and offered gloves. "Take this pair of mine," he said. "It's cold up there. If you have to bail out above 20,000, you'll need them."

to earth (well, almost) to recount the thrills of his first ride in a jet.

No doubt I looked at him in mute gratitude. He was so matter-of-fact—as though he'd just suggested stepping into the local ice house!

Checked out to me next were a seat cushion and a parachute pack, almost as large as the wearer. When all of this was strapped on, I felt as amply turned out as a deep sea diver.

"The only items omitted are a pressurized suit and a 'Mae West' for flying over water," observed one of the officers.

While a truck drove us down the field to the readied T-33, the pilot told me confidentially that many people, even fliers with thousands of hours in conventional type aircraft, become very airsick during the first ride in a jet.

Next came a meticulous item by item pre-flight check—fuel tanks, flaps, landing gear and wheels, tires, hydraulic system, air intake and thrust elements. Following this, a detailed cockpit check was made.

The passenger was then invited to climb into the rear cockpit and face forward, where he was strapped down with care in front of an instrument panel on which were a variety of colored light bulbs. "Looks just like a pinball machine," Captain Kuhn had said.

With a rather dry throat, I meditated on pinball games at 25,000 feet when the pilot again climbed the ladder on one side of the rear cockpit and a crewman stepped up on the opposite wing. "Over there is the 'panic light'," said Captain Thompson. "If it flashes, you know we are in big trouble. Things can happen with one of these birdies. It's always a good idea to know how to take care of yourself."

A speech by Capt. Edward Kuhn (above), jet test pilot at Pinecastle, resulted in jet hops for Civil Air Patrol members.

"Should you find yourself in a situation where you must leave the airplane," said the pilot, indicating a lever on the right, "pull this. The bubble canopy is then thrown up and off the ship. Next, grasp these two handles on either side, low down, and keep your feet on the rest, head back."

"Low down is right," I agreed, in a palsied whisper.

"These releases, when compressed," continued the pilot, "will set off a mechanism which is equivalent to giving the occupant a kick in the pants of about 15 G's. Fifteen times gravity. The entire seat will be thrown several feet into the air, you in it, and clear of the airplane.

"You are then sitting in this seat, the same as in a rocking chair, five miles above the earth, for instance. All you have to do is unstrap the chair and let it fall off you. You may then count three and pull the rip cord. Your parachute will open."

"How about just giving me a kick in the pants, 15 G's right here on the ground," I was trying to mumble, as they hooked up the oxygen, explained instruments and pointed out the vital oxygen blinker which opens and closes yellow lips on a dial every time one breathes.

There was fascination in watching this little blinker. At least it indicated that I was still breathing.

Presently Captain Thompson was in his seat up ahead and at a signal the jet motor started and snored amiably somewhere back of us. The canopy moved down part way. From the control tower, signals come through the earphones and we started to taxi north around the tower for take-off position.

Pilots are careful to give other aircraft or vehicles a wide clearance, for it is reported that the hot exhaust from a jet will take the paint (*Continued on page* 43)

Far ahead of the industry when test-flown

in 1941, Germany's revolutionary and versatile Me-262

Sturmvogel *ranks with the great planes of all time.*

THE blueprints of aviation will always be years ahead of current production. Airplane development is a tedious process, with highly advanced planes and engines visualized long before they become reality. Jet propulsion for aircraft was dreamed of before World War I, but it was 25 years before the first jet engine was actually built.

This is the rule in aviation and, like every rule, has its dramatic exceptions. Over the years, there have been several planes notably "ahead of their time." The Martin B-10 of the early '30's was faster than most pursuits of the day. The Boeing B-17A could fly well above anything else in the air. The Lockheed P-38 had a 50 mph speed advantage over any other military plane of 1939. The deHavilland *Mosquito* enjoyed the same speed advantage over Axis planes for two years.

Overshadowing all of these is still another plane—a plane whose performance in some respects has not been equalled today, nearly 12 years after its first flight . . . a plane whose latest variants will still be flying several years hence. The plane is the German jet super-fighter of World War II—the Messerschmitt 262 *Sturmvogel* or *Stormbird*.

During the War little was known of the Me-262. After V-E Day more information was printed, but the whole story of the *Stormbird* was not disclosed until vast files of German documents, captured by the Allies at war's end, were sorted and classified. When this was finished, in 1948, interest in military aviation was at a low ebb and, even then, much of the information was restricted. The following first complete factual account was gleaned through an exhaustive search of this information.

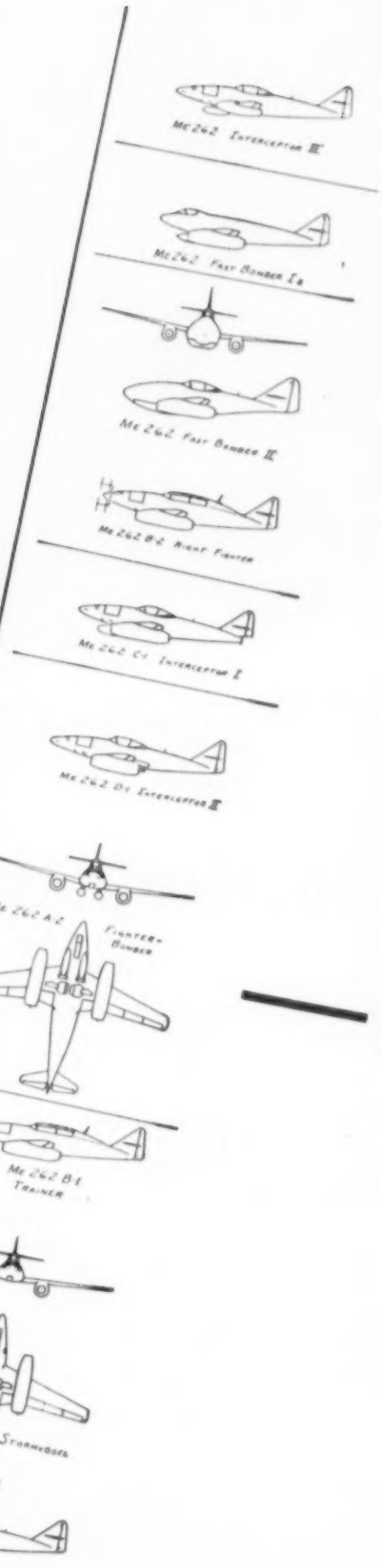
The initial design of the Me-262 was begun in late 1938. As a fighter it would make use of the Junkers Jumo T.1 and possibly the BMW P.3302 turbojet engines, which were begun at the same time and subsequently re-designated the Ju.004 and BMW.003. The original design project was labeled the Me-P.1065 and not until 1940 was the designation Me-262 generally used. It bore a close resemblance to the model A-1 in use at the close of World War II except for its tailwheel type undercarriage.

The Me-262 V-1 airframe (V for experimental prototype) was completed before the jet engines were near the flight stage. To test the plane's characteristics it was fitted with a Jumo-211 reciprocating engine and first flown in March, 1941.

Many flights in the succeeding year showed that the Me-262 in this form could not be controlled by the average pilot. It was used as a flying test bed for the first flight of the turbojet BMW.003 in late 1941, still with the Jumo in the nose. An attempt to use the Heinkel He-S8 turbojet engine, which became available at this time for use in the He-280, met with failure as the Messerschmitt

The Stormbird

By ROBERT CASARI


Me 262 Interceptor III
Me 262 Fast Bomber Ia
Me 262 Fast Bomber II
Me 262 B2 Night Fighter
Me 262 C1 Interceptor I
Me 262 B1 Interceptor II
Me 262 A2 Fighter-Bomber
Me 262 B1 Trainer
Me 262 A1 Stormbird

could not get off the ground with this low thrust power plant.

The Jumo T.1 jet engine was flight tested in the early months of 1942, slung under the belly of an Me-110 twin engine fighter. The Me-262 flew with these jet units for the first time in July, 1942—not 1943 as frequently quoted. In spite of bad handling characteristics and vibration, the Me-262 reached a speed of 448 mph at sea level, well above the fastest Allied service plane of the time.

This was nearly a year before the first flight of the British *Meteor* in March, 1943, and 18 months prior to the January, 1944, flight of the U.S. Lockheed XP-80—a lead which the Germans maintained up to V-E day. The Jumo T.1 (later redesignated the Jumo .004A) was as yet available in very limited quantities and lasted only a few hours before compressor or turbine failure occurred.

By the time the second Me-262 had been flown, a nosewheel replaced the existing tailwheel, since large chunks of concrete were being thrown about by the downward blast of the jets and forward visibility while taxiing was bad. However, the nosewheel, used on all subsequent models, was a continuous trouble spot, prone to shimmy and collapse.

By mid-1943, the Ju.004B prototypes were doing 540 mph straight and level at 21,000 ft., and had been dived at 590 mph. This version was demonstrated before the brass of the German Air Force. (*Continued on page* 46)

No, this is not a neighborhood fruit market. It's the plant quarantine room at Idlewild, where three inspectors begin their week by examining the week-end harvest of contraband carried by incoming passengers.

By DAN PEARSON, Jr.

Battling the Bug and the Blight

INTERCEPTING and impounding tons of contraband plants and plant products that every year reach the United States via its seven international airports is the job of the Plant Quarantine Division of the U.S. Department of Agriculture.

At New York International Airport (Idlewild), where the set-up is typical, 17 inspectors work around the clock to guard against the entry of harmful insects and plant diseases capable of causing damaging, if not ruinous, infestations of U. S. agriculture and livestock.

As soon as the passengers have left a transocean airliner arriving at Idlewild, a quarantine inspector boards the plane and begins a thorough search for discarded plant material. He probes into seat pockets, beams his flashlight along the blanket racks and clears the galley refrigerator of leftover foods. Maintenance crews cannot tow the plane from the apron until the inspector signifies that it is "cleared."

While it is unusual for an American returning home to allot any of his limited baggage allowance to anything except clothing and personal items, many visiting foreigners have different ideas. Their suitcases are frequently crammed with fruits, plants and vegetable delicacies from the homeland. Unless such passengers have previously obtained import permits from the Bureau of Entomology in Hoboken, N.J., it is unlikely that they will be allowed to retain their plant booty.

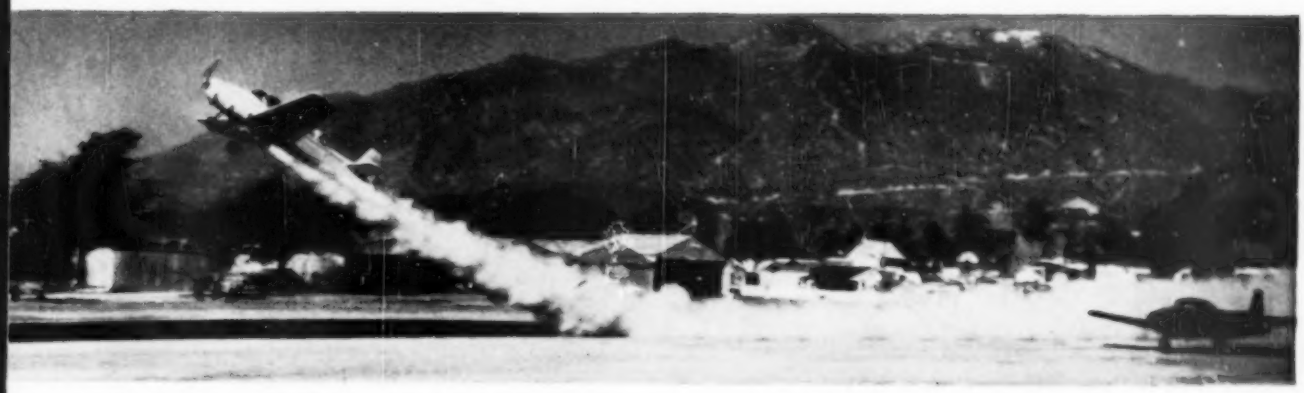
If the passenger has brought in a bouquet of cut flowers, he may be lucky. Five groups of woody-stemmed cut flowers—roses, rhododendrons, azaleas, lilacs and the cape jasmine or gardenia—are not prohibited when brought in from certain countries, provided they are free from pests and disease.

Identification of the thousands of different insects which may arrive as stowaways is the task of the entomology experts. A daily shipment of the "little monsters" goes from the airport to a laboratory in Manhattan. Any insect that baffles the experts there is rushed to Washington, D.C., to be examined and identified.

Bad actors such as the Japanese beetle, the European corn borer and the potato weevil, and such destructive plant diseases as the Dutch elm, cercospora and potato wart, are all prominent in the rogues' gallery of plant quarantine. But nothing will make an inspector's hair stand on end quicker than mere mention of the notorious Mediterranean fruit fly. This aggressive little insect, which fortunately has been eradicated in the United States, infested Florida citrus orchards in 1928 and caused more than $15,000,000 damage. When his task of seizing prized possessions seems especially distasteful to an inspector, he has only to think back to that "fruitless year" for new incentive. END

"Sorry, you'll have to leave those with me," a Customs Inspector at Idlewild tells a passenger arriving from Europe. The inspectors become hardened to the occasional charges by irate passengers that the food will probably end up as part of some inspector's lunch. *Center*, a Customs Inspector turns over to a Quarantine Inspector an anthurium plant brought in by a passenger. Examined and found free of pests and disease, this plant was returned to the owner. *Right*, Chief Quarantine Inspector Claude Post checks certificates on pre-inspected plants flown to New York from San Juan. The plants brought in by passengers are insignificant in comparison with commercial plant cargo.

At right, Inspector Jose Ramos, an expert in tropical plant diseases, uses a 90-power binocular, a spotlight and various chemicals as aids in the primary identification of a disease that has infected a piece of fruit brought to Idlewild from overseas. It is believed the U.S. has the world's most elaborate system of protecting its agriculture. *Below*, methyl bromide spells death to insects after the plant material they infest is placed in the fumigating chamber. Here Inspector A. J. Turner measures the dosage to treat a batch of commercial cotton samples flown in from India. *Below, right*, a "bonded" parcel of Japanese silkworms, bound for a Swiss research laboratory, is placed in a refrigerator by Inspector Fred Johnston. At a temperature between 37 and 40° F. the worms will be kept inactive. Such brokerage service is provided by the U.S. Government for plants and insects to be used for scientific study.



Two *Navions* take-off. The plane at left, with JUNIOR JATO, reached 100 ft. altitude before the other, without JATO, had left the ground.

JATO—The Magic Bottle

Necessity was mother to the invention of JATO, a boon to short strip or high altitude take-offs.

By WILLIAM B. BULLOCK

SINCE the days of Genghis Khan, when Chinese soldiers battled the Mongol horde by the use of gunpowder and bamboo projectiles, man has searched for a way to harness the potential of rocket power.

This is the story of how the scientists succeeded in putting this power to work as a modern weapon.

It started in 1939 when the late General H. H. Arnold and scientist Doctor Theodore Von Karman were discussing the feasibility of jet-assist take-offs for heavy military airplanes.

The huge bombers which were to blast the Axis into submission were still in blueprint stage, but Gen. Arnold was worried about how the big war birds would perform if forced to operate from tiny combat airstrips.

Dr. Von Karman, a veteran pilot of World War I and a renowned aerodynamicist, listened attentively as Arnold told of his fears. The General had long believed that some form of jet-assist for aircraft take-off was feasible and necessary, and asked Von Karman if a compact auxiliary power unit could be developed.

The answer thoroughly pleased Gen. Arnold. Small rocket motors, Dr. Von Karman theorized, could be developed not only to boost big airplanes aloft faster but also to allow them to carry up to 20 per cent greater loads. The scientist also pointed out that rocket motors of the type he had in mind could be mounted externally on any structural part of the airplane, and jettisoned once the propellant had been expended.

A Boeing B-47 *Stratojet* streaks skyward with the aid of JATO. This bomber has provision for 18 JATO units, with nine installed on each side of the fuselage.

A few days later Dr. Van Karman found himself with a new job, commissioned to head an Air Corps project to be known as ACJPRP (Air Corps Jet Propulsion Research Project.) Sole purpose of ACJPRP was to develop with all possible speed a jet-assist motor capable of boosting big airplanes into the air—fast!

Von Karman chose two former students as assistants—Drs. Martin Summerfield and Frank Malina, along with two rocket technicians, Edward Forman and John Parsons. A tiny laboratory was set up in a dry gulch near Pasadena, Calif., and the group set to work.

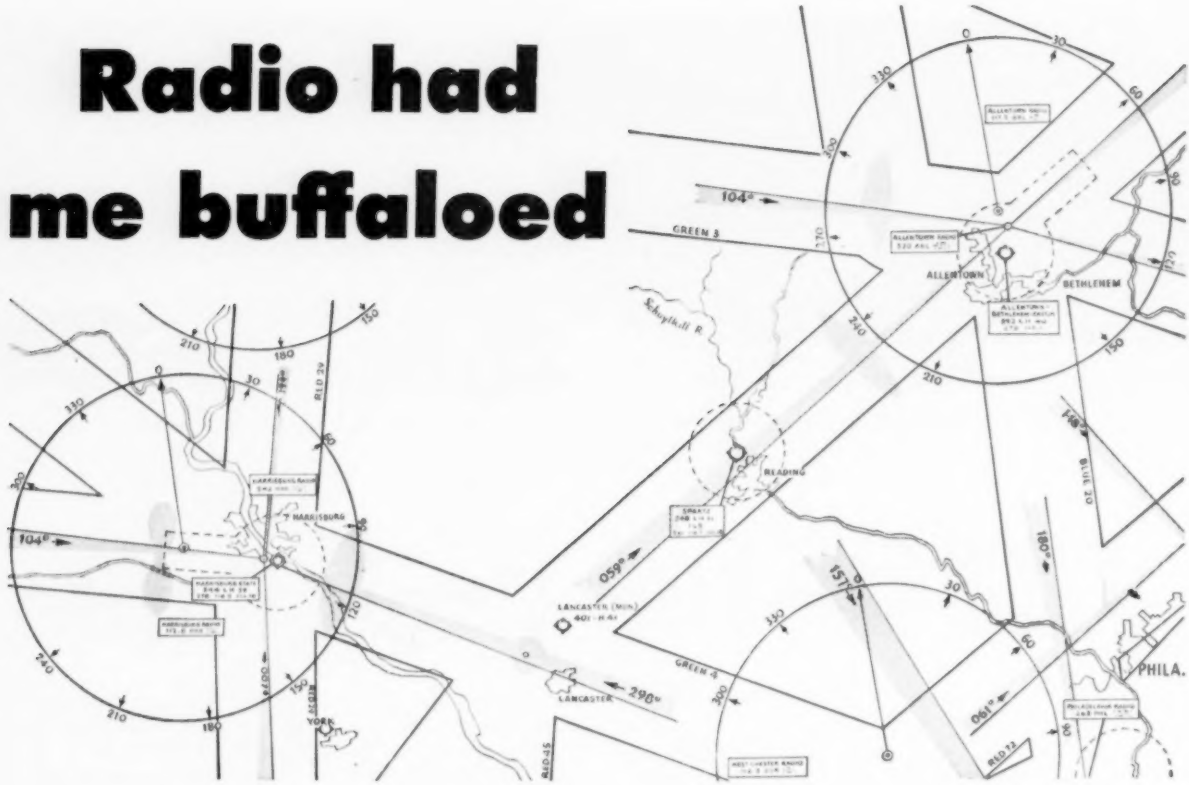
Almost a full year passed and then—success. Two types of propellant looked good. One was a liquid, the other a solid. When ignited in a special cylindrical test chamber either propellant shot a blast from a nozzle faster than the speed of sound. The thrust was terrific.

Months later, after minor changes in their formula and perfecting of a chamber body for the propellant, the quintet planned to test the new rocket motor on an airplane. One morning in August '41, a little Ercoupe, with the world's first jet-assist rocket motor attached to its belly, taxied down the runway at Muroc, Calif., and was literally shot aloft when the pilot released the rocket charge. "JATO," for Jet-Assist Take-Off, was here to stay.

Plans were made to put JATO into mass production but due to differences of opinion in Washington the Air Corps dropped JATO in favor of longer runways. This decision almost wiped out the Aero-Jet Engineering Corporation, which had been formed by Dr. Van Karman and associates to produce the motors.

Navy, however, was having its troubles in the Pacific. As aircraft carriers probed deeper into enemy waters, it became increasingly difficult to launch the heavily loaded fighters and torpedo bombers in adverse weather. Tests made with the new jet-assist (*Continued on page* 44)

Radio had me buffaloed



Used properly, your aircraft radio can be more help than a co-pilot.

By FRANK L. HARVEY

NOT too long ago I was scared stiff of radio. I got that way trying to work out a range-orientation problem —one of those razzle-dazzles where you figure out the average bisector of two possible quadrants, steer at right angles thereto, and then try to dope out, by the dots and dashes you hear, whether you are headed for the safety of the station or barreling merrily off into the boondocks.

Maybe *you* can work this stuff. Not me. I couldn't even work it in the quiet of my bedroom without much skull scratching and cross checking. Heaven help me if I ever had to work it when I was *lost*.

After I came up with an answer, I flipped a page in the text book and was confronted with the happy news that even though I might have worked the deal perfectly, a strong wind could have fouled me up completely. I quickly flipped another page, in self defense, and found that radio beams have been known to do all kinds of queer tricks. In mountain areas they often split up into three or four little "false beams," bend at 45° angles, or go off the air completely.

Then I flipped the book shut.

Radio, said I to myself, is not for you. It is for Air Force types who spend their lives messing with these matters, or for airline pilots who get paid for unscrambling beams and the like. For you, my boy, the CAA sells sectional aviation maps. If you just fly in clear weather and keep the check-points under control, you can forget radio completely, and good riddance!

So I actually flew for over a year with an excellent radio in my plane and never turned it on except when I was approaching an airport and wanted to get landing instructions from the control tower. I sweated out the map in hazy weather and didn't have much fun on some trips because I had no time for anything except peering apprehensively down in search of the next check point. Radio had me buffaloed.

As the result of an unmerciful razzing by a veteran X-C pilot, I finally turned my radio on, found out how to use it, and have been kicking myself ever since for having been such a dope. Radio isn't just for hotrocks. It's for you and me—provided we don't let it make us so lazy and careless that we never bother to look down and see where we happen to be at the moment. Radios do malfunction, you know, and static sometimes gets so heavy the set gives off sounds like 14 wildcats locked inside a trunk. At a time like that it's good to know approximately where you are, so you can use the map to get you safely down.

If you thoroughly master the important basic points of radio, which you can do in one easy lesson, you'll have very little trouble.

In the first place, forget about trying to work complicated range orientation problems. In a lightplane your drift can be completely unpredictable, and, alas, your compass can be temperamental to the point of pointing 20° or 30° off the heading (it's happened to me, often). It's silly to work out a complicated orientation problem, right on the button, and then find you're lost anyhow, due to drift and compass error.

Let's get down to business. (*Continued on page* 48)

At left is the author, a 25-year-old commercial pilot who has been flying for eight years. He spent a brief hitch in the Air force as a crew chief, flight engineer and dispatcher. At present he's manager of Fort Scott (Kans.) Airways. *Below*, a hangar-side makes an excellent billboard to announce that the operation's services include air ambulance, aerial photography, crop spraying, charters, carrying cargo, plane sales.

Willing to work?

There may be a future for you

in the charter business.

By W. S. THOMAS

Charter Know-How

THE air charter business is good. All you need is an airplane—and enough salesmanship to convince a man that he can make more money on the job than on the way to it.

If the first prerequisite seems to stump you, consider the fact that there are lots of good four-place airplanes on the market for from $1750 to $2500 that will fit most anybody's requirements to start. That's about the price of an average automobile and if, in this day and age, you can't scrape up enough to buy an automobile you are not sharp enough to be in business.

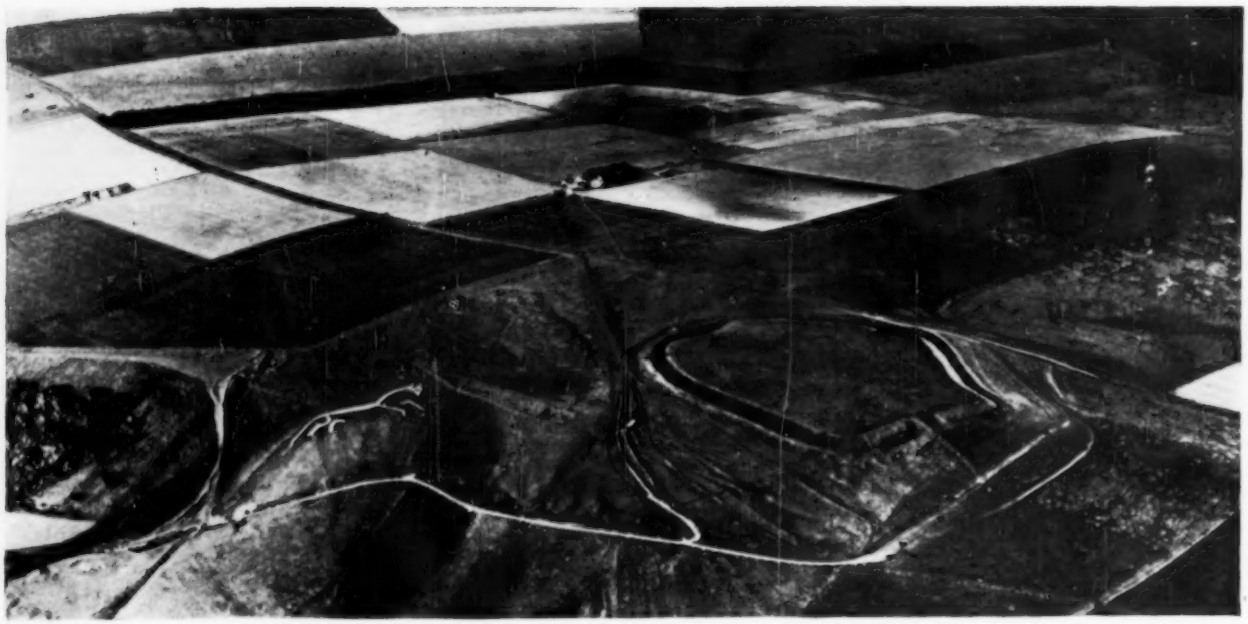
If the second prerequisite stops you, you won't be sharp enough to stay in business.

Now that you see how simple it is, how do you get started? First of all, get in touch with your nearest CAA safety agent and inform him that you wish a non-scheduled air carrier's certificate. He will inspect your aircraft and your own personal qualifications. Minimum requirements are a commercial license for yourself and a licensed day contact aircraft. As for equipment, an adequate supply of maps, a computer, and a first aid kit are desirable accessories.

As we said, "The charter business is good." You are selling a commodity that is becoming more and more important every day—TIME for the busy businessman. With the accelerated pace of business today, more and more men and companies are finding that time spent en route is deadhead expense. The average businessman who travels can be shown in a relatively few minutes that eight or 10 hours en route on a train or by automobile is a day's wages lost. At the current price of skilled man-power several of these days per month can amount to a rather large figure.

Remember, you are selling time, not fares. Sell your customer on the saving of time, convince him of this fact, and the savings of lodging, meals, etc. naturally follow. After you have made your initial point, then you can show him the benefit of arriving at a destination fresh and in a relaxed state of mind. Casually mention the prestige of traveling by air; both as a modern method of travel and impressive evidence that the salesman was really interested in seeing the customer.

Business is taking to the airplane, and the alert and progressive charter operator is finding new and ever growing sources of income. Only a few years ago the charter business was looked upon as purely a luxury for the well-heeled traveler. Today it is regarded by more and more businessmen as the (*Continued on page* 42)



Above, the White Horse of Uffington, Berkshire, is believed to be one of the oldest hill figures in England. To the right of the horse is Uffington Castle, a hill fort of the Early Iron Age. Arrangement of ditch, banks and entrance are valuable clues to scholars. *Below*, is the old Cirencester-Silchester Road at Stratton St. Margaret, Wiltshire. Whenever a British road runs in a straight line to the horizon, it's almost sure to be part of an old Roman road. Roman occupation of Britain ended before the year 450 A.D.

(Photographs from The Department of Antiquities, Ashmolean Museum, Oxford.)

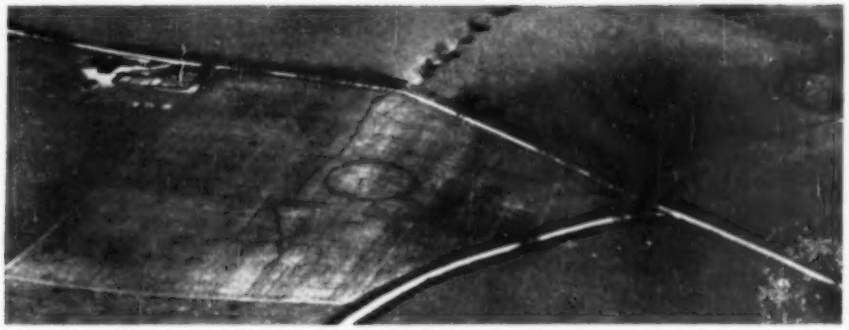
FLIGHTS

FLYING is liable to lead a person into almost any field these days, anything from mineral and oil prospecting to commercial fishing or ornithology. The most interesting subject it has taken me to is, believe it or not, archaeology. England, in particular, is indescribably beautiful from the air and sooner or later the sightseeing pilot is bound to become curious about something he has seen. That is the point at which British fliers realize they are fascinated by archaeology. Find the textbooks and bring out the maps!

Professional archaeologists have been taking to the air, too, ever since it was discovered during World War I that buried remains, not visible from the ground, often showed up on aerial photographs. This has been the great discovery. Many fine new sites, such as Woodhenge, in Wiltshire, have been found through aerial research. By use of photographs, careful studies can be made. Science has benefited when the fliers' and the archaeologists' interests have met . . . and merged.

I lunched recently in Oxford with an archaeologist of the Ashmolean Museum there and his pilot, an old friend of mine.

The Ashmolean is justly proud of its imposing collection of thousands of aerial archaeological photographs taken over a number of years. Many were taken by Major G. W. G. Allen, an enthusiast who flew about in his own airplane for several years taking pictures of likely sites in Wessex. At his untimely death (from a motor-



These two pictures are of the same field at Ogbourne St. George, Wiltshire. The ground view at top gives hardly a hint of the ancient circle dramatically visible in the aerial view at the bottom. Such crop markings, where the soil was once disturbed, remain indefinitely, perhaps even for thousands of years.

Don't let that word "archaeology" frighten you—it spells fascinating adventure for the airman.

INTO THE PAST

By JANE G. PLANT, *F.R.G.S.*

cycle accident, incidentally) the entire collection went to the Ashmolean Museum, and some large prints are always on display there.

Although different types of remains may be shown by different methods, certain archaeologists from Oxford are making a specialty of what seems to the lay person the most revolutionary use of the aerial photographs. They interpret certain light and dark shadings in the landscape to guide the excavations. These crop and soil markings, which reveal buried remains, are a result of differences in thickness of the topsoil.

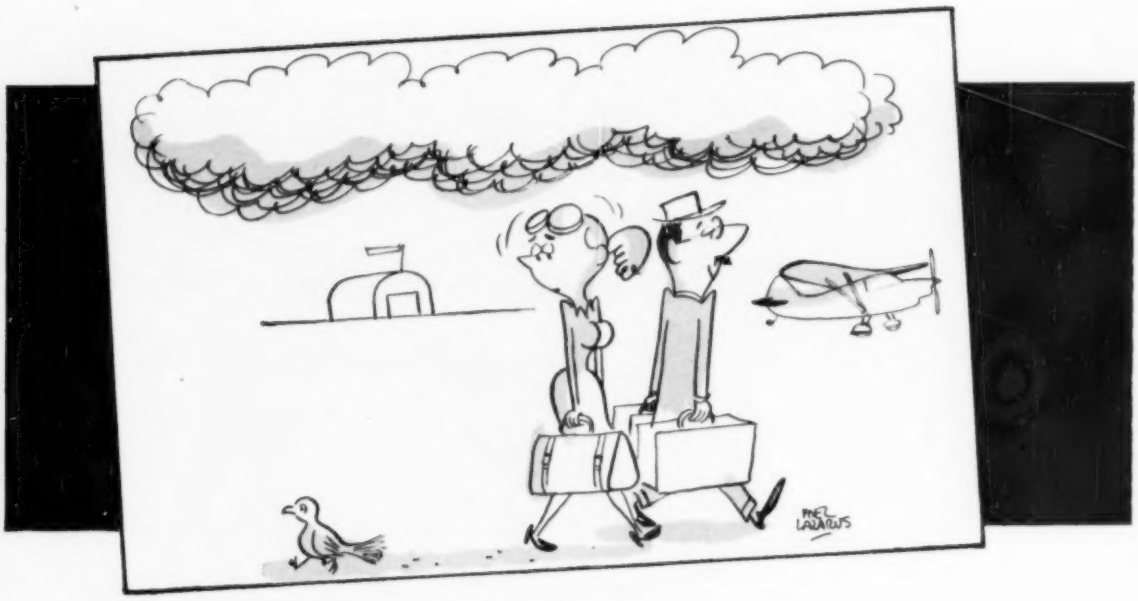
The thick cereal crops like wheat will show, at their height, the presence of buried rubble, ditches, pavements and the like, by differences in color and thickness. Where the soil is thinner, as over an old wall, the wheat may be short, pale in color. The pattern of it can show even the exact outline of buried masonry, say a Roman villa or an ancient enclosure. Where the soil and the crop are thicker an old ditch may be indicated in the picture.

In winter, similar variations may show in slight but ordered differences in the color of the soil.

These markings are especially visible to the camera and are usually not noticeable at all from ground level. Also, they seem to remain indefinitely, even for thousands of years. The pattern of ancient Celtic fields appearing recently through present cultivations is an outstanding example of this.

From just such crop markings (*Continued on page* 46)

The Cerne Giant, an old hill figure above Cerne Abbas Village, Dorset, is one of many patterns made by exposing chalk in soil.



SHE COULDN'T SAY NO!

THE hardest lesson in flying for me has been learning to say "no" to a passenger. It takes all my moral fibre to look my companion in the eye and inform him I don't like the looks of something, and don't propose to have any truck with it. "We're going to sit down as soon as possible, and stay as long as necessary" are wise words; but there are times when they stick in my mouth like dry sand.

I can't bring myself to admit out loud that although flying is the most marvelous way of getting around, there are many times when it must not be attempted—not in a one-lung puddle-jumper. I confess I've a big chunk of ego wrapped up in my ability to fly. It seems incredibly exciting to have this skill which is still possessed by relatively few.

Each situation I'm about to describe was one which I knew to be marginal. I've lots of experience and a large bump of caution. Had I been alone, I'd not have taken off until conditions improved.

EXHIBIT I

Early last June, Molly, my flying companion, flew me from Chapel Hill, N. C., to Charlotte, where I had to pick up several paintings and a piece of sculpture. Len White, a former student of mine, happened to be in town so we put him in the back seat and took him along for the ride. Charlotte is only an hour away from Chapel Hill in Molly's Stinson. There is a postage stamp airstrip within a few miles of the Mint Museum. With Molly at the helm, we journeyed over pleasantly, borrowed the airport manager's jalopy, and vibrated over to the museum. I collected my works of art and we came bucketing back to the strip. The sun shone and the wind had died. We loafed on the grass eating sandwiches, then began to think about going home.

We looked up and down the tiny strip, which was about as long as a farm driveway and in pretty much the same shape. Little puffs of air patted our heads from all directions. The windsock moved hither and yon in leisurely indecision. It was hot.

Molly said, "You fly back."

I had flown the Stinson a bit—15 minutes here, 15 minutes there, a few take-offs and landings. I understood the general idea, but I wasn't sharp. I didn't have that "feel" of the airplane. I should have said, "You do it this time, you know the ship better."

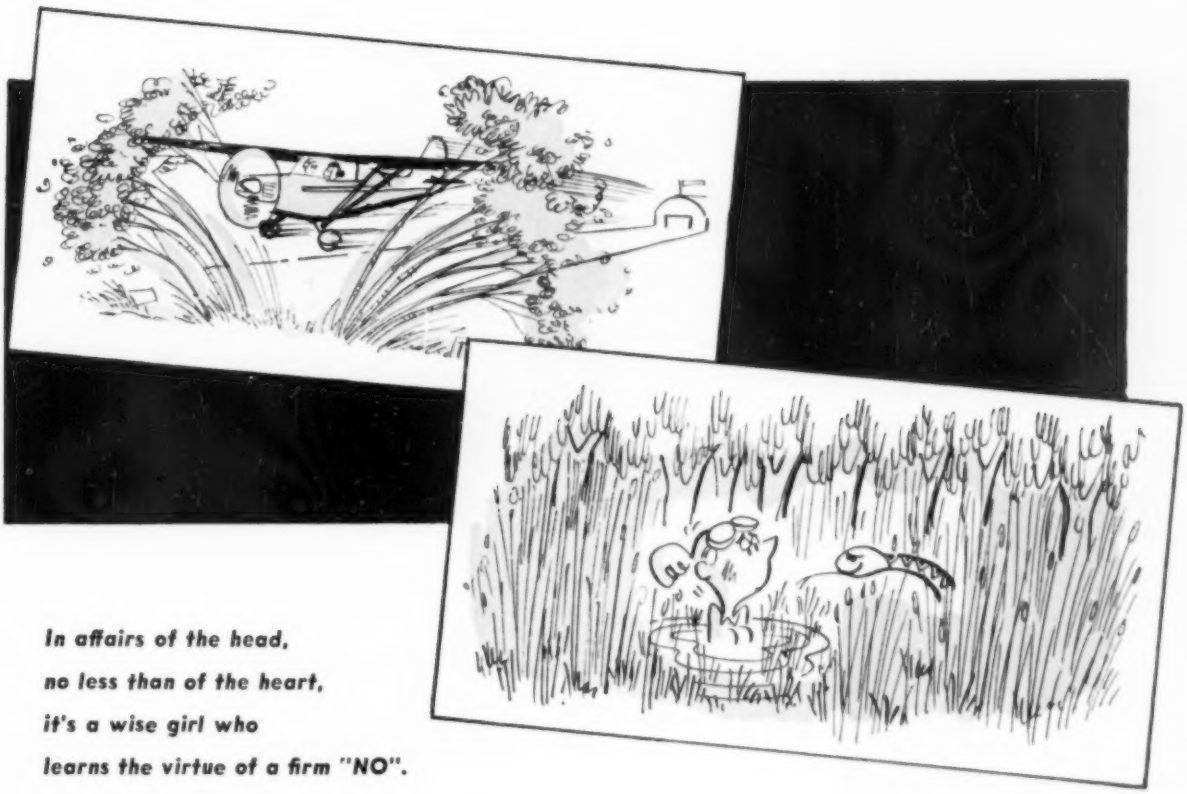
Obviously, an airplane COULD take off if everything clicked right. This was an operating airport. Light-to-middling aircraft flapped in and out all the time. But the strip was very short, cut off from wind, with a pond chopping across one end and a low hedge of trees across the other. Here we had a tricky small field; and I was about to barrel at it in a ship with which I had only a nodding acquaintance.

I set both the airplane and the field up against me when I answered, "Yes, I'd like to."

Dope!

I've flown out of all sorts of places from coast to coast —super airports and turkey runs. I know a doubtful situation. I knew this one was marginal. But I was afraid of seeming chicken in front of my student. A pilot shouldn't have an ounce of pride!

After the two paintings were stowed in the baggage compartment, and Len and the sculpture in the back seat, I stuck the Stinson's tail wheel into the pond, checked



In affairs of the head,
no less than of the heart,
it's a wise girl who
learns the virtue of a firm "NO".

By EMMA LOU DAVIS

everything (except my own common sense), put on half flap, set the brakes, opened the throttle and away we lumbered. Possibly the wind had veered again. The Stinson paddled happily along enjoying its toes in the dust, and I broke into a light sweat. When more than half the runway had gone, and the trees were slapping us in the face, I hefted the stick.

There was nothing there.

Molly sat beside me, dead-pan as a juggler and cool as a cucumber, but when we compared notes later, she told me she had had her hand poised to cut the switches. In desperation, I released the elevators, squeezed my knees together, clapped imaginary heels to the old horse —and rode it straight at the fence. When we were almost on the barricade, I hiked back on the wheel again, and this time the red *Voyager* sailed the saplings like a hunter. Perhaps it would be more accurate to say it parted them like a comb.

That ended that problem. I had just come within a hair's breadth of smearing thousands of dollars worth of somebody else's airplane, with three people in it—and all because I didn't have the gumption to SAY "no" when I thought no.

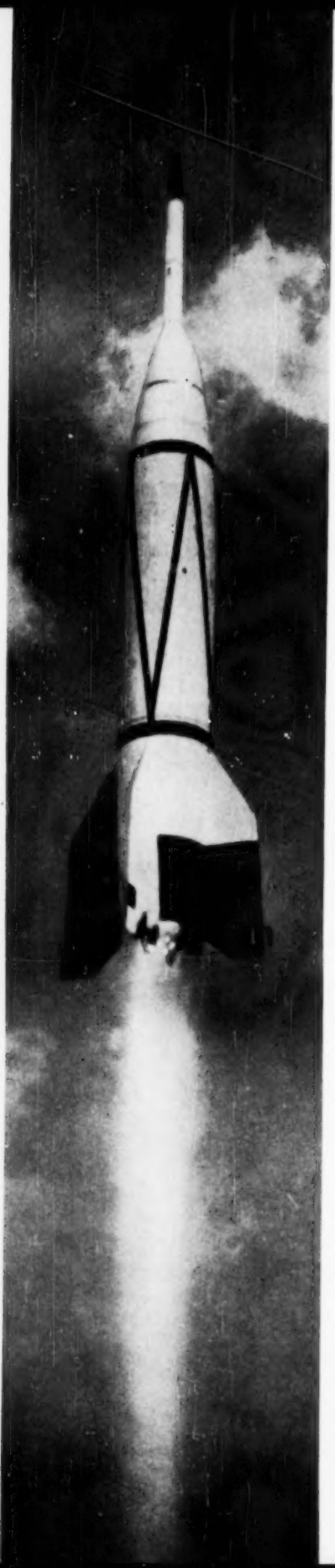
EXHIBITS II and III

Thunderstorms figured in my two other horrible examples.

In July, 1946, with 100 hours in my log book, and a brand new Cessna 140, I flew Dan Sullivan from L.A. to Elko, Nev. There were thunderheads around when we started, but the Mojave Desert is big and I managed to give them all a wide berth. They sailed over ridge and valley, casting ominous shadows on the red desert and towering aloft to awe-inspiring heights. Their rumbling and blasting was far away, and outside of an occasional whizz-bang gust, nothing bothered us.

When we got to Olancha, and sighted the Owen's River Valley, I could see it was full of storm. A purple black mass was jammed in there like a cork in a bottle, and frequent flashes of lighting left no doubt as to its nature. For those who do not know this valley, let me say that grappling weather in it would be like being penned in a broom closet with a tiger. The valley is 75 miles long, and only about four wide. To the west rears up the Sierra headwall; on the east it is fenced by the Inyo range and the White Mountains, all big babies. Westerly winds pour over the headwall, break into surf in the valley, and bounce off the Inyos. Here is the famous Bishop Wave, which can carry a glider up to 40,000 feet, and here the gusts can turn a light craft upside-down.

At least I had sense enough to land on the abandoned strip at Olancha and wait for developments. I'd never before stuck my nose into one of Nature's fits of rage, but nobody had to tell me that the (*Continued on page* 55)



Project Bumper

On a red-letter day in the annals of space conquest, the Army's two-stage rocket whistled up 250 miles into the blue.

BY J. GORDON VAETH

U. S. Navy Special Devices Center
Office of Naval Research

"WHITE SANDS, N. M., Feb. 24—The gateway to space was reached today! A rocket was fired this afternoon which climbed to an unprecedented altitude of 250 miles above the Earth. This height—one million three hundred thousand feet—is the farthest that man has ever reached out toward space, the closest that he has ever come to sending a rocket to the Moon, the planets, or the stars . . ."

This is how the press might have reported a rocket firing which took place on February 24, 1949, at the U.S. Army Ordnance Proving Ground, White Sands, New Mexico. Identified only as Project BUMPER, the firing was carried out in strict military secrecy. Until recently, few details have been available about this, the highest flight ever achieved by a man-made object. With the declassification of some aspects of the project, it is now possible to reconstruct the firing and to piece together what was one of the outstanding news events and scientific accomplishments of our time.

Project BUMPER was a result of a 1946 decision by the Army Ordnance Department to build a two-stage rocket missile. To achieve this, a 16-foot long WAC CORPORAL rocket was to be mounted on the nose of a 45-foot long V-2 for launching from the V-2 while in flight. Such a two-stage rocket combination, said Army Ordnance, would outperform all other existing rocket vehicles—and it did!

For a launching site, the Army chose the White Sands Proving Ground, frequently in the news for rocketry "firsts." Situated in the Tularosa Basin of southwestern New Mexico, the Proving Ground contains an area roughly 40 miles wide and 120 (*Continued on page* 64)

Start of the highest rocket flight ever made! The black markings on the BUMPER rocket are reference lines which make the missile visible to observers in the optical tracking stations.

There was an ample snow carpet when this Cub was fitted with skis.

I learned about flying from that!

It takes more than one snowfall to make a winter—or even one flight on skis!

By ALBERT W. BAILEY

MICHIGAN'S Thumb may be a vacationist's paradise in summer, but it isn't so much of a paradise for pilots in the winter or early spring. Come snow, and you shift to skis. A few days later it thaws, and you put the wheels back. And so it goes—off again, on again. And while the ground may be white with snow at your home airport, less than 100 miles away the ground may be bare.

As a student pilot with only about 50 hours logged, I was anxious to fly and to get away from the boresome monotony of flying around that pattern. That old J-3 seemed like a milkwagon—just kept going round and around that route. She'd pretty nearly take herself around. Occasionally I'd get out of the pattern and fly over to my own farm and back; just had to let the wife see that I could fly the ship. Maybe I was getting a bit too cocky.

I pestered the instructor for some cross-country. Finally one day when the weather wasn't too bad—or too good—he gave in and consented to go for a triangle hop of approximately 150 miles. Had to have him along for I wasn't endorsed as yet for XC. We had skis on, and there was plenty of snow on the airport. In fact there seemed to be plenty of snow all over the Thumb. At least I *thought* there was.

We gassed up and the tank seemed to be full. Note I used the word "seemed." I didn't check the tank. I merely assumed that the gauge was right. I knew better but somehow or other—well, I just took a chance. The instructor let me. Possibly he had a reason. I wonder.

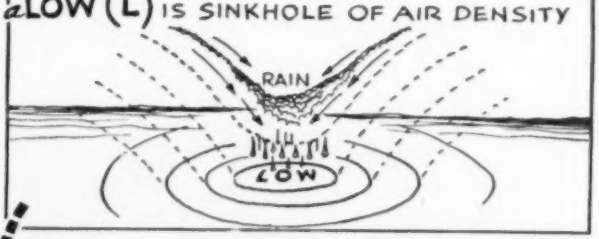
At the Sebewaing airport the weather was just a bit thick to the west and north. There was plenty of ice out on the bay and it was fairly cold. We took off and headed for Almont, 60 miles away and a little east of south. We made fair time and I was enjoying myself. Underneath the ground showed white all the way. The weather seemed to be clearing and at 1,200 feet it was just nice.

We came in over the wires at Almont, made an uneventful landing and taxied up to the hangar. We stayed about 20 minutes and then took off for Flushing, 40 miles to the west. As I taxied down to the take-off position I noticed for the first time that there wasn't as much snow on the ground as there was at Sebewaing. Yet I thought nothing of it.

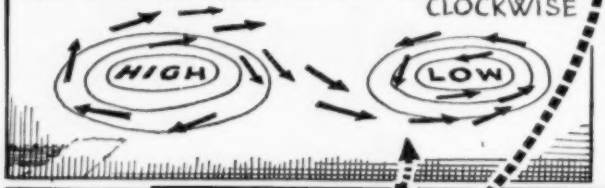
Twenty minutes on our way and I saw there were bare spots under us. They grew bigger (*Continued on page 65*)

a HIGH (H) IS A MOUNTAIN OF AIR DENSITY

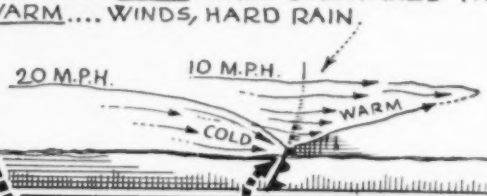
a LOW (L) IS SINKHOLE OF AIR DENSITY



NOTE HOW WINDS BLOW CLOCKWISE **OUT** OF THE HIGH *and* **INTO** THE LOW COUNTER-CLOCKWISE



an **OCCLUDED FRONT** (▾▾▾▾▾) IS WHERE A COLD MASS OVERTAKES THE WARM.... WINDS, HARD RAIN.

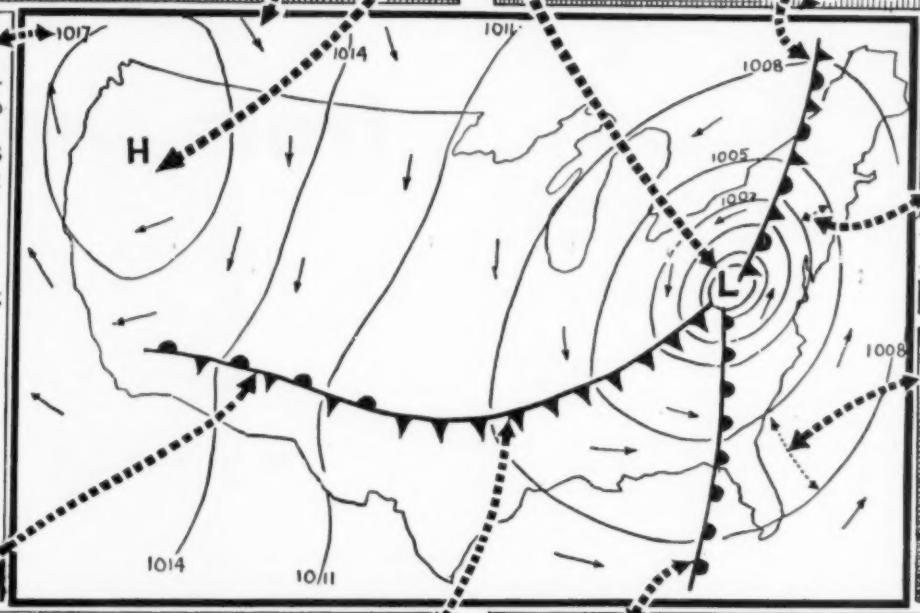


NUMBERS ARE JUST MEASUREMENTS TO INDICATE CONTOURS OF *the* AIR DENSITY.

THEY ARE OFTEN IN MILLI BARS

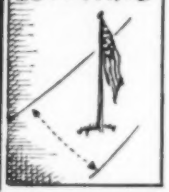
1011

29.86 OR INCHES OF MERCURY

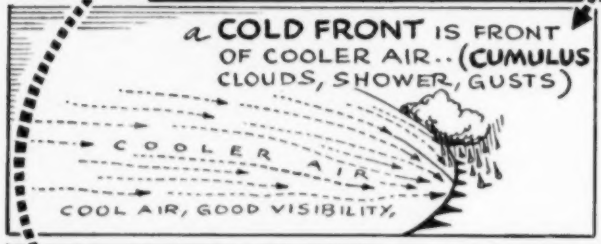


CLOSE ISOBARS, HIGH WIND

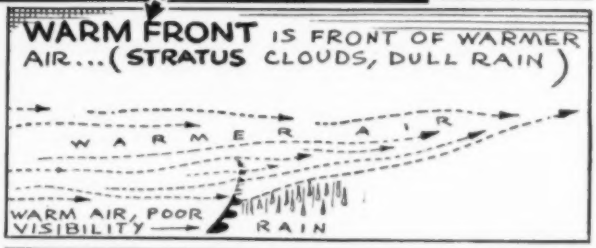
ISOBARS FAR APART, LOW WIND



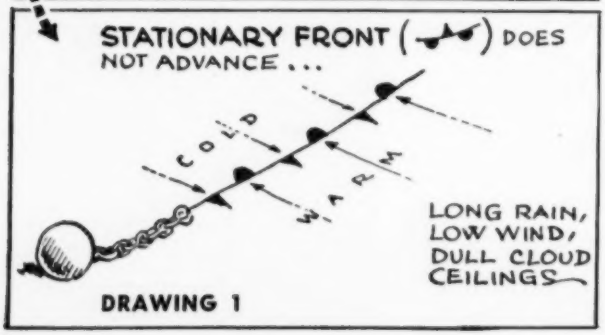
a **COLD FRONT** IS FRONT OF COOLER AIR.. (**CUMULUS** CLOUDS, SHOWER, GUSTS)



WARM FRONT IS FRONT OF WARMER AIR... (**STRATUS** CLOUDS, DULL RAIN)

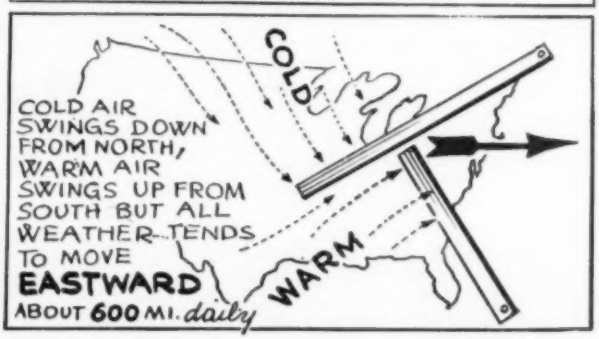


STATIONARY FRONT (▾▴▾▴) DOES NOT ADVANCE ...



LONG RAIN, LOW WIND, DULL CLOUD CEILINGS

DRAWING 1



COLD AIR SWINGS DOWN FROM NORTH, WARM AIR SWINGS UP FROM SOUTH BUT ALL WEATHER TENDS TO MOVE **EASTWARD** ABOUT **600** MI. *daily*

On meeting the weather map

Do you REALLY understand those curves and fronts and figures?

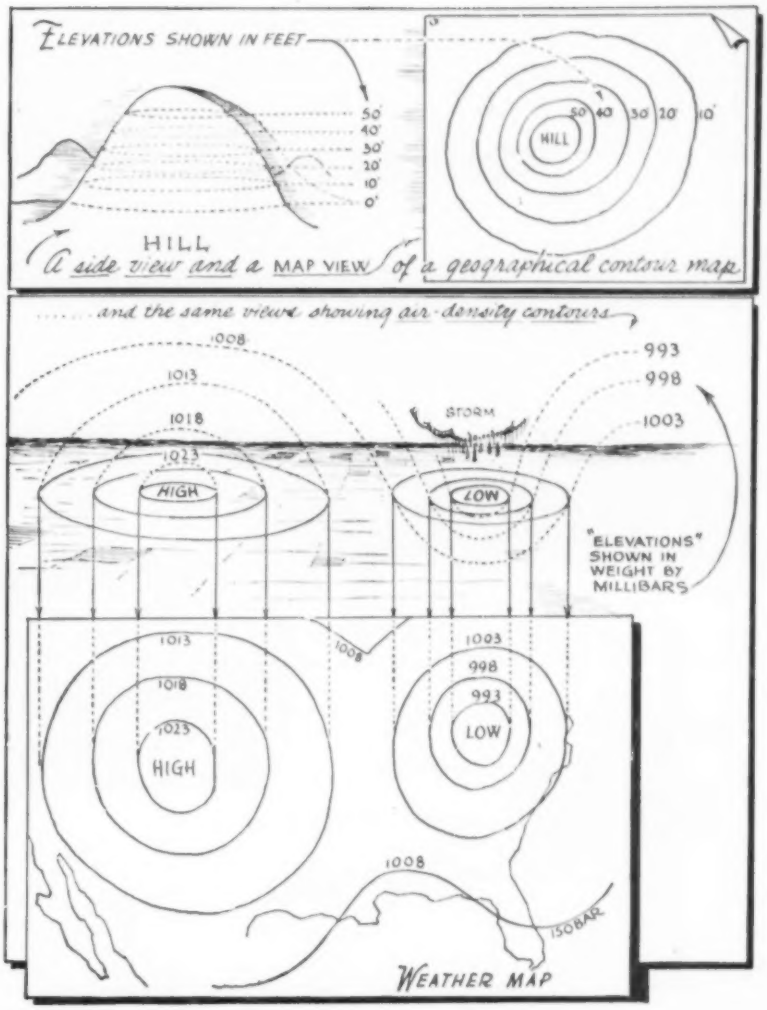
By ERIC SLOANE

IF YOU fly, you are already familiar with weather maps. This article may be old stuff to you. But there may come a time when you want to explain weather maps to your wife or to little Johnny, so bear with me.

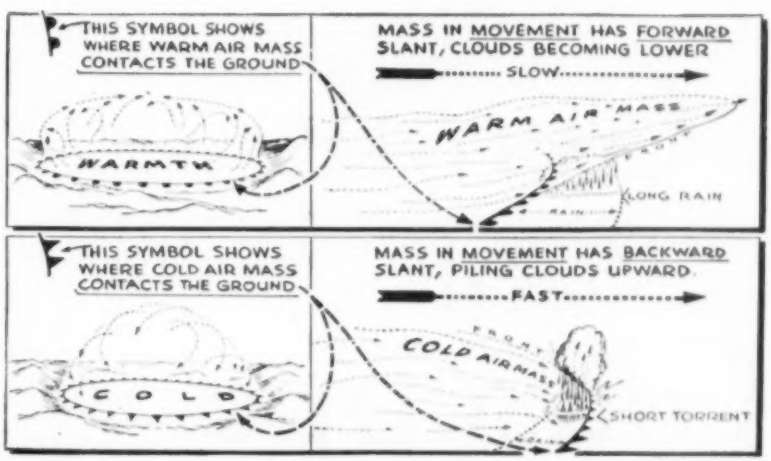
There are too many intelligent people who first open their newspapers to the weather map, look it over and, with an assuring click of the tongue, go back to the news without having the slightest idea of what they looked at.

The first thing to explain about a weather map is that it is exactly like a geographical contour map, but instead of showing the contours of solid earth it shows contours of atmospheric density. The isobars or lines on the weather map are just like the lines that show elevation on a geographical map; each "high" or "low" is identical to a swelling mountain or a thinning valley which is flowing (usually west to east) overhead.

When an air mountain flows on top of you, you have more weight upon you and so the air pressure here below is known to be "high." When an air valley (*Continued on page* 56)



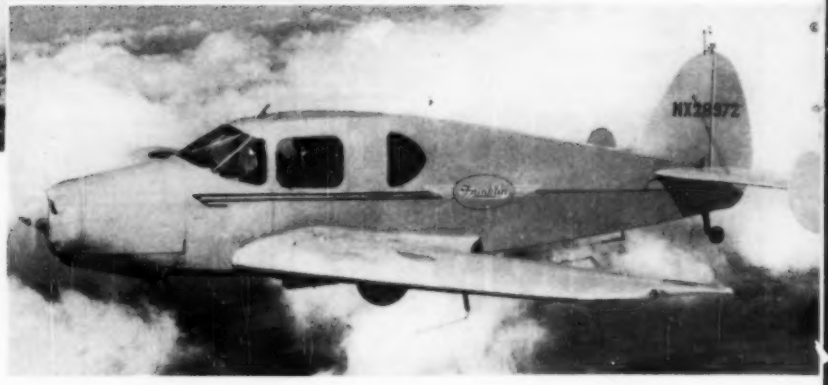
DRAWING 2


THIS SYMBOL SHOWS WHERE WARM AIR MASS CONTACTS THE GROUND
WARMTH
MASS IN MOVEMENT HAS FORWARD SLANT, CLOUDS BECOMING LOWER
SLOW
WARM AIR MASS
LONG RAIN
THIS SYMBOL SHOWS WHERE COLD AIR MASS CONTACTS THE GROUND
COLD
MASS IN MOVEMENT HAS BACKWARD SLANT, PILING CLOUDS UPWARD
FAST
COLD AIR MASS
SHORT TORRENT

DRAWING 3

This is the seventh of a "Weather Wisdom" series by FLYING's Weather Editor, Eric Sloane. The material is suggested by the manuscript of *Eric Sloane's Weather Book*, which was recently published by Duell, Sloan and Pearce—Little Brown.

At left, the first Bellanca plane, built in the U.S., is shown in flight at Mineola, Long Island, in 1912. *Below*, is the *Cruisair*, built by Bellanca following World War II for the private and commercial plane markets.



For 40 years fortune has eluded Bellanca, but there are none in aviation who deny

The Genius of Giuseppe

By LT. COL. ROBERT H. RANKIN
United States Marine Corps

GIUSEPPE MARIO BELLANCA, but for a turn of chance, might have seen his plane fly to fame with Lindbergh.

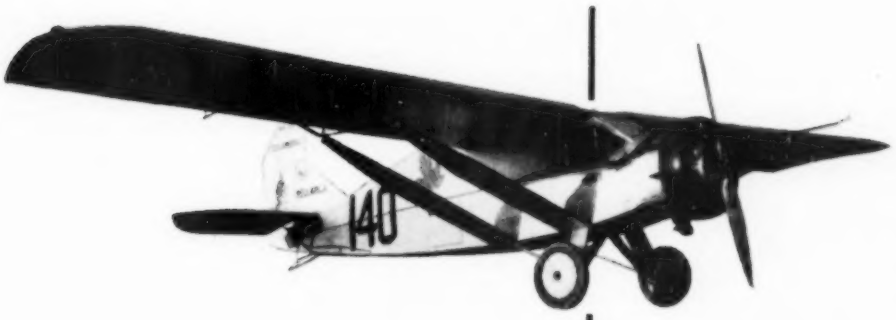
But this was only one of the turnings of fate in the life of this quiet and unassuming little aeronautical engineer. A designer of marked ability, he continually encountered insurmountable obstacles in capitalizing on his designs, which in many instances were far advanced for the times. Authorities are agreed that no man has done more for the progress of aviation with less return in material wealth than Bellanca.

Born some 66 years ago in Sciacca, Sicily, Bellanca received a sound education in science, graduating from the Institute Technico in Milan, Italy. For a time he instructed in mathematics at Milan but, having become interested in aeronautics as an undergraduate, left teaching to study design. Certain that better opportunities awaited him here, he sailed for the United States in 1910.

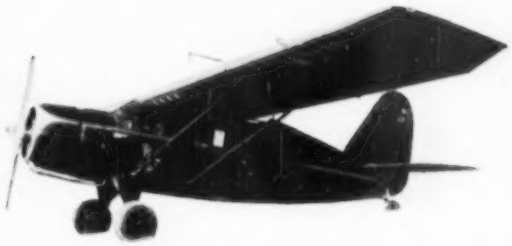
So it followed that, in the basement of the Bellanca home in Brooklyn, his first American-built monoplane began to take form. Giuseppe's father and brothers helped him with the woodwork and metal parts while his mother, probably with many misgivings, sewed on the linen wing covering.

Of necessity, the craft was constructed as economically as possible. Cloth for wing covering cost but six cents a yard. After all, that was enough to pay for it, for the designer knew exactly what loads would be imposed.

The power plant was the simplest thing possible: an engine, a propeller, a gas tank, and a shut-off valve. The ignition switch was rigged to the steering wheel, while the throttle control was an adaptation of the motorcycle type.



At left, the famous Bellanca "Columbia," which brought fame to many pilots, including Bert Acosta and Clarence Chamberlain. *Below, left*, Giuseppe Bellanca confers on plans for the *Cruisair* with Bruno Salvadori.



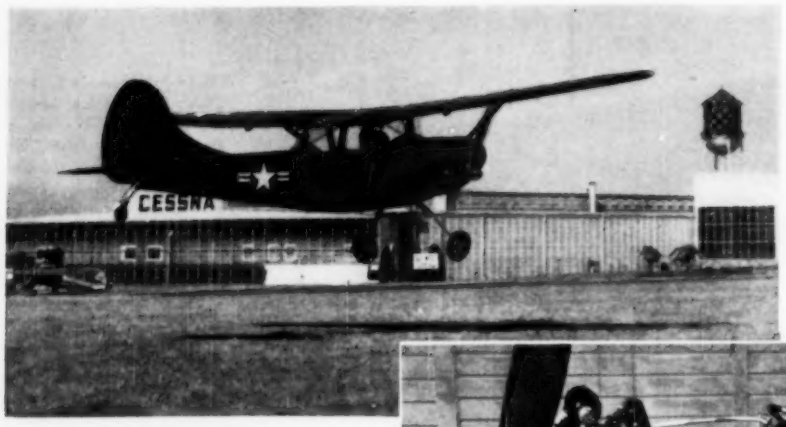
When the plane was completed, it was carefully transported to Mineola Field, Long Island. Dire prophecies greeted its appearance there. Bellanca was used to the skepticism of "experts" by this time, and he calmly proceeded to test the craft and at the same time teach himself to fly.

At first he taxied the craft carefully down the field, turned it around by hand, and taxied back to the starting point. He continued this procedure until he had the "feel" of the machine, then would hop the craft into the air for distances of five or 10 feet. Gradually these hops became longer and longer until at last they became so long that it was impossible to land the little airplane in the field. Bellanca was compelled to turn in the air and circuit the field.

On his first solo flight of this kind, while skimming some 100 feet in the air, the philosophy of the old folk back in Sciacca came to mind—the belief that if the good Lord had intended man to fly, He would have given him wings. "But," argued the nervous Giuseppe with himself before making his first turn in the air, "a brain was given me to devise wings, so I built this machine. Now, Giuseppe, God may let you know before you get down again what He wishes in regard to your flying." The turn was made without incident. So elated was the pilot that he made a whole series of turns before coming in for a landing.

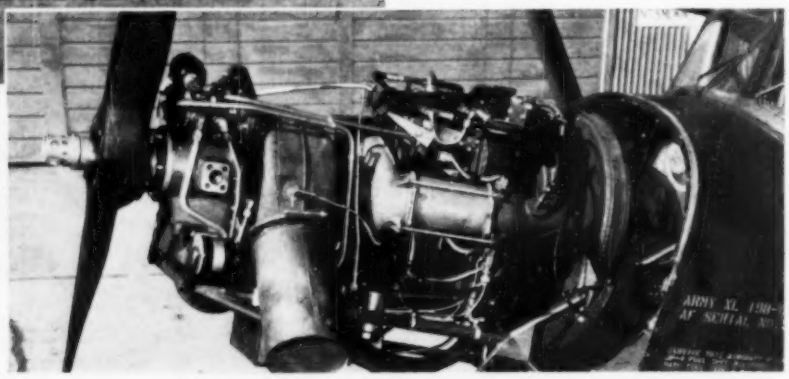
After several days of self-instruction, Bellanca joined the ranks of instructors at Mineola. Among his first pupils were the late Fiorello LaGuardia, former mayor of New York City, and "Mile-a-Minute" Murphy. By coincidence, while Bellanca was teaching LaGuardia to fly, LaGuardia was teaching Bellanca (*Continued on page* 60)

The four Bellanca planes above are, top to bottom: 1) *Aircruiser*, built in 1935 in passenger and cargo models and supplied to the Army and civilian users; 2) The "Liberty," a later model of the "Columbia." This became the fourth Bellanca plane to cross the Atlantic non-stop, when flown from Newfoundland to Germany in 1931; 3) *Senior Pacemaker* of the middle '30's. The popular civilian plane, powered with a 420 hp Wright Whirlwind, had a top speed of 170 mph; 4) The "Cape Cod" made history in 1931 when it was flown 5,000 miles non-stop from New York to Istanbul, Turkey.

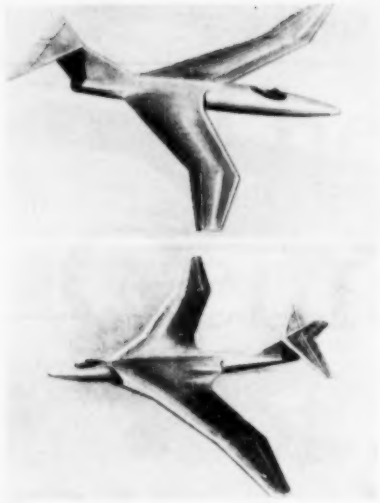


CESSNA XL-19B

At left, taking off for the first time, is the world's first gas turbine-powered light airplane. The powerplant, shown below, is the new Boeing 502-8 gas turbine, previously tested in a highway truck, two types of Navy small boats and a Navy helicopter. The turbine is installed in the combat-proven L-19 *Bird Dog*, with modified mounts and cowling. The advantages of turbine over conventional engine include simplification of power plant installation, elimination of cooling problems and the virtual elimination of vibration.



HAVE YOU SEEN?

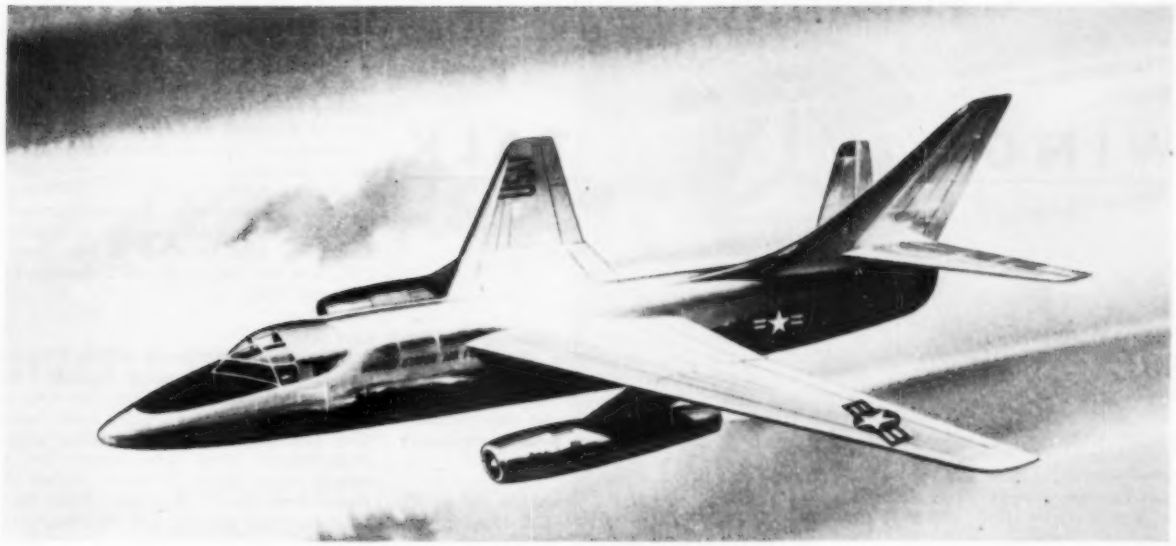


CRESCENT WING

British designers are currently studying the crescent wing as a new answer to problems of supersonic flight. The crescent is designed to incorporate best features of delta, swept-back and razor-thin straight wings. The new wing is said to give excellent control and insure no ill effects to the aircraft as it meets the sound barrier. Designs are from Short Bros. and Harland Ltd.

1953 TRI-PACER

Increased space for passengers and baggage, a new oil cooling radiator under the spinner, a new outside door for baggage loading, a new door in the aft belly for easier maintenance and greatly improved sound conditioning are principal improvements in the four-place Piper *Tri-Pacer* (and the three-point-landing gear *Pacer*) for 1953. Standard powerplant is a 135 mph, four-cylinder *Lycoming*, giving the *Tri-Pacer* a cruising speed of better than 125 mph. Top speed is 137 mph, stalling speed with flaps, 48 mph, and cruising range, 580 miles. Fuel consumption at 75 per cent power is 7.7 gph. Fuel capacity is 36 gal. The cabin has been widened and lengthened and additional headroom is provided. Baggage space is increased from 6 to 12.5 cubic feet and maximum baggage allowance from 50 to 100 lbs. Aft of the rear seat is a new shelf, 28 in. deep, for hats, maps, cameras, etc. Reduction in noise is accomplished by a stainless steel exhaust muffler and a heavy Fiberglass envelope surrounding the cabin on top, bottom, sides and rear, with double thickness on fire wall and cowling. Both side windows are sealed tight, with a small sliding panel on the pilot's side. Individual ventilators permit air circulation. The noise reduction is estimated at about 20 per cent.

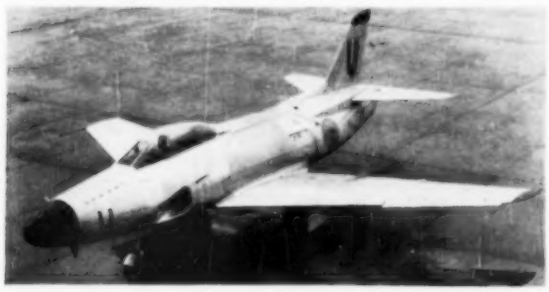


DOUGLAS RB-66

Above is an artist's conception of the Air Force's photo reconnaissance version of the Navy's A3D attack bomber. The swept-wing, twin jet performs in the 600-700 mph class and can fly above 40,000'. The plane is said to fly faster, over longer distances with a greater striking load than any plane of comparable size that is now in service.

DEFENDER

First post-war airplane to be built in Japan will be the Fletcher FD-25 *Defender*, a "baby bomber" designed for use by ground forces as a rocket launcher and bomb carrier. Armament includes two 30 cal. machine guns with 1,000 rounds of ammunition for each gun; four 5-inch HVAR rockets or 40 2¾-inch rockets in clusters. Toyo Aircraft Co. of Tokyo will build the FD-25 by arrangement with Fletcher Aviation Corp., Pasadena, Calif. Sales will be restricted to non-Communist countries. Photo is at right.



SAAB-32

A new Swedish jet aircraft (left), the Saab-32, built for the Royal Swedish Air Force, has been test flown. Intended for attack operations against ground and sea targets, the swept-wing jet has a top speed in the region of 700 mph and is powered by a Rolls Royce Avon axial-flow engine. The distinguishing features include flush air intakes and fairings at the root of the movable tailplane.

RONDONE

Italy's Ambrosini *Rondone* (below) is a side-by-side lightplane with a three-wheel retractable gear. Normally powered by an 85 hp Walter Mikron engine, the plane has a cruising speed of 140 mph and range of 435 miles. The span is 28", 3"; length, 20', 3". The plane is built by the Societa Aeronautica Italiana at Milan.

WING TALK

THE '53 EXCHANGE

The 1953 International Cadet Exchange was announced at a party held for the air attaches of the countries which will take part in the next (sixth) Exchange at Washington's Shoreham Hotel. Maj. Gen. Lucas V. Beau, host, announced two new nations added to the "Exchange roster"—Greece and Turkey—making 18 countries of the free world for the '53 program.

Attaches attended from all but one (Luxembourg)—Brazil, Belgium, Canada, Denmark, France, Great Britain, Greece, Italy, Mexico, Holland, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and the U.S., which will be represented in the Exchange as usual by CAP cadets.

Two National Hq officers, just back from an official visit to England's Air Training Corps headquarters, report that cadet exchange and summer encampment selection criteria will be sent to the field shortly. Col. Wm. H. Trachsel, deputy chief of staff, Operations & Training, and Maj. Ray L. Urton, director of Cadets, were in England on the invitation of the ATC to see how that air youth organization works. ATC is the British equivalent of the CAP cadet program.

* * *

Col. Bernt Balchen (USAF), noted aviator and pioneer polar explorer, spoke to the Fairfax-Falls Church (Va.) Sq on the history of aviation in the Arctic. Balchen illustrated his lecture with color slides he had taken during years of exploration at both poles.

* * *

Lt. Col. Albert H. MacKenzie (USA) pinned Observer wings on his son, Cadet Franklin F. MacKenzie, of the Alexandria (Va.) squadron at a National Capital wing ceremony. Having seen a lot of this done in his time, Colonel MacKenzie said this was something extra special in his military career.

* * *

An air show that will take place mostly on the ground but good enough to draw a two-day crowd of 100,000 is in preliminary planning stage by the Virginia wing. To be held at Byrd Field, Richmond, the huge air fair plans to draw interest from a large section in the east, since many innovations in air showmanship will be used, a wing spokesman reported. Target date is for middle May.

* * *

Rosemead (Calif.) Group 15 held an effective event at Rosemead airport by simply putting to the task of making as many members and cadets as possible efficient and qualified in flight operations. That meant orientation flights for 30 cadets and refreshers for 25 seniors.

Maj. J. C. O'Brien, group CO, said this was only one of many such days planned in making the group more operational and proficient.

* * *

Old Baldy (Calif.) squadron put up 23 members in a FILTRACK mission for the Ground Observer Corps, who reported the traffic to the Santa Ana Filter Center. Back again at base, the unit showed a new film, "The Reserve Team," to cadets and members.

WINS BREWER TROPHY

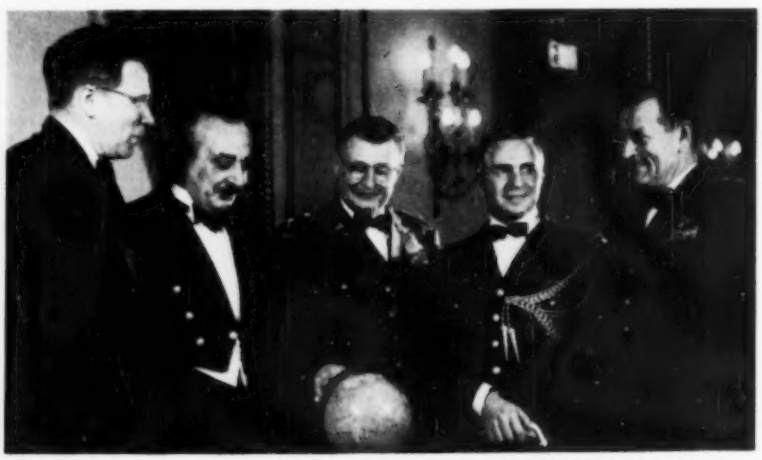
The 1952 Frank G. Brewer Trophy was presented to Civil Air Patrol during the recent Wright Memorial Day dinner. The citation from Col. Harry K. Coffey, president of National Aeronautic Association—custodian of the trophy—praised CAP's senior membership for having developed aviation education programs both for cadets and teachers. Special mention was made of the two aviation education workshops held by CAP at San Juan, P.R., and the University of Colorado, in 1951 and 1952.

FAST RESCUE

Down in the wilderness between Nome and Hot Springs, Alaska, in their de Havilland *Beaver*, USAF Lts. Jim Young and Nick Tsacrios got a quick assist from Maj. Les Bronson, of the Alaska wing. Preparations were being made for a search when Major Bronson landed at Nome with the lieutenants. They had been reported missing only two hours at the time.

Bronson was on a flight to Hot Springs when he noticed something on the bleak tundra, went down to look and effected a rescue.

CADETS OF THE Syracuse Squadron keep a watchful eye on the Syracuse Filter Center control board. The hours of accredited time at this volunteer duty is listed after each cadet's name. They are (l. to r.) Sgt. Walter Purtell, 25 hours; 1st Sgt. Robert Merola, 67 hours; Pfc Rene Thibideau, 22 hours; Pvt. John Klotz, 70 hours; 2nd Lt. David Lyon, 73 hours; 1st Sgt. John Argus, 214 hours; 1st Lt. Ronald Smith, 16 hours; Pfc Mark Synder, 52 hours; Pfc William Munro, 30 hours; and Pfc Joseph Carella, 91 hours.



GENERAL BEAU pinpoints on a globe the nations which will participate in the 1953 International Cadet Exchange. With him as guests at a dinner held in Washington in honor of the air attaches of the participating nations are (l. to r.), Hon. Edwin V. Huggins, Assistant Secretary of the Air Force; Gen. Enrico Cigerza, Italy; Gen. Beau; Air Brig. Gen. Jacques L. Murtin, France; Maj. Gen. Roger M. Ramey, Director of Operations, USAF.

Report to the Nation!

FLYING's

SPECIAL DEFENSE ISSUE

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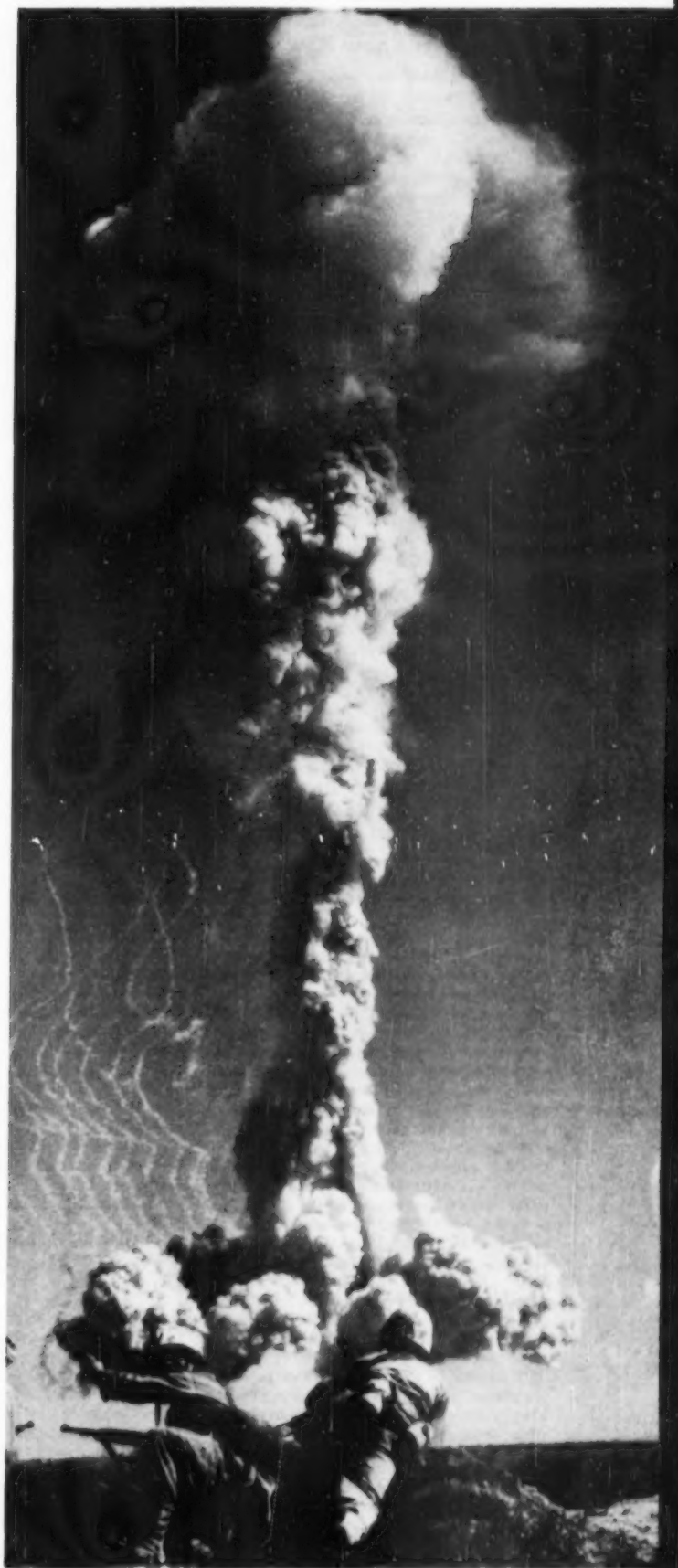


Charter Know-How

(Continued from page 27)

pleasant and economical way to travel.

Let us take some figures, for example. Most businesses today allow their representatives about seven cents per mile for automobile travel expense although many men who keep accurate records of their automobile expenses will tell you it takes at least 10 cents a mile to operate an average automobile when you include insurance, depreciation, etc. An average charge for a charter operator is about 15 cents per mile. When you show your customer that it is costing him only five cents per mile more to travel by air than by surface travel it is not too difficult to convince him that the savings in time, hotel bills and food which would be incurred by surface travel would more than add up to the extra air fare. Then, too, there will be fewer nights away from home and family, spent in lonely hotel rooms or expensive cabarets. As a clincher, don't forget that air miles are generally about 25 per cent less than surface.

First Impressions

Now that we have settled the economics, let's take your first passenger. Regardless of the type of aircraft, its appearance is important. No customer likes to arrive at the airport and be ushered into a dirty or muddy airplane. The first impression many times is the lasting one. Keep your equipment clean, and, of course, well maintained. One minor breakdown or engine sputter due to faulty maintenance generally will cost you that customer.

Insist that your pilots, and see that you yourself, are properly dressed. You are flying and selling businessmen air travel and you have to be a businessman yourself or at least look like one. The days of the leather jacket or open collared shirts for the charter pilot are a thing of the past. Wear a suit and a tie or appropriate sports clothes. Some charter customers especially on overnight trips will keep their pilots with them for company or whatever assistance they might be. This often involves going to dinner with your passenger and perhaps enjoying a show or some entertainment with him in the evening.

While en route, the courteous pilot will feel his passenger out as to whether or not he wishes to engage in conversation, to be shown the country over which he is flying, or whether he prefers to spend his trip quietly going over business forms or planning the day's business ahead of him. Don't force your personality upon your passenger. Pilots with unpleasant personalities don't make successful charter pilots. Many customers, once they have become accustomed to one pilot, will decline a trip rather than go with a strange pilot. If you are an operator keep your eyes open and whenever possible arrange for a previously satisfactory pilot to fly with his customers.

Be a Diplomat

There is a science to flying charter customers. In many cases it is the little things that count. Don't continually fuss with your maps. The new customer instinctively gets the feeling that you are lost. Watch your passenger for any sign of discomfort, whether due to uncertainty, rough air or physical discomfort. Some passengers need a little reassurance in regard to weather, rough air or the capabilities of the aircraft. Be a diplomat. Don't try to impress them with what a hot rock you are.

Never demonstrate an aircraft's capabilities to a charter passenger. Did you ever see an airliner try maximum performance climbs or come over the field at 1,000 feet and try to land in the first third of the runway? Make your takeoffs long and shallow. Make your approaches the same way. In the event of necessary go-around on landing, be careful to explain to your passenger that it is necessary due to traffic conditions or some other cause. If you can't control your emotions so as to cover up any outward sign of concern due to weather conditions, aircraft performance or the like, you had better take up some other profession. Just remember, if you scare them from now on they are going to take the train.

One of the biggest decisions that the charter pilot has to face concerns the passenger who *has* to get there come hell or high water. Oftentimes charter customers are men whose business or particular trip involves a large deal of some sort. Many dollars are involved and to the customer that is the most important thing on his mind. Many times these passengers do not realize the danger in weather. After all, if they knew as much about weather and flying as you do they would probably be in the business.

It is up to you, not the passenger, to decide whether you go on or stay on the ground. Remember, no trip is worth your passenger's life or maybe your own. Perhaps you feel that if you don't get him there you will lose his business. We have been through this and we are quite satisfied that even those who sit on the ground eventually realize they are safe, and maybe it was not quite so important to be there at 9:30. They will think more of you and have more confidence in you in the long run, and a passenger's confidence is a pilot's biggest asset.

There really is little to be said here about the virtues or non-virtues of night and instrument flying. There are many operators who fly night and on instruments, and there are quite a few who do not take the business. If your capabilities and your equipment are not suited to night flying and you never start, then rarely will they expect it.

Always make every effort to take a passenger to smooth air. Even if there are better winds at a lower altitude, air bumpiness may be encountered. Slight savings of time and gasoline consumption are not worth the passenger getting a bumpy ride.

Above all, always file a flight plan. Your customer is entitled to it. Also, it does not hurt to ask the tower, around the not-so-busy airports, to call a cab. Your customer will appreciate this.

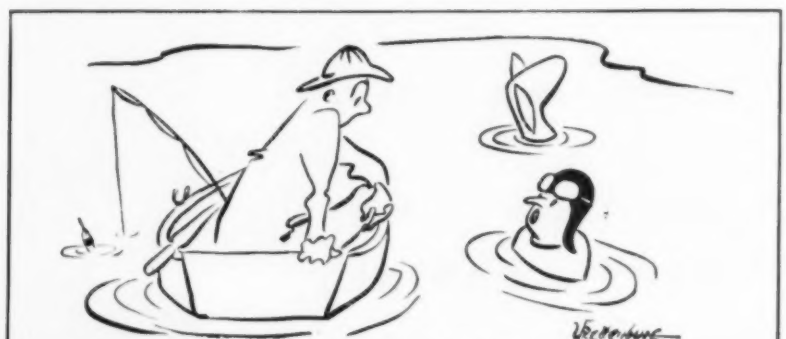
How're You Doing?

If you are an operator and are not getting your share of charter business in your locality, run this tally on yourself. Is your equipment suitable? Does it look like an airplane? Is it the type of aircraft that a businessman wants to be in when he is met by his customer at his destination? Is it clean? Is it safe? How is your personal appearance? Are you shaved and are your clothes pressed and suitable? How is your conversation? Is it intelligent or does it dwell principally on superficial things?

Are you hustling? Does the public in your area even know that you are in business? Although a large part of your advertising will be by word of mouth from satisfied customers, it still pays to advertise. A small display ad in your local newspaper might work wonders. Have you tried it? If you have an office and a telephone, do not fail to use the classified pages of your telephone directory. Is your office clean, neat and attractive? A shoddy operation leaves but one idea in your potential customer's mind—a shoddy airplane.

The business is there. Go after it. Charge a reasonable fare but do not be tempted to cut what you have once established as your necessary price in order to maintain your equipment, operate and show a profit. You can't stay in business without a profit.

Charter flying opens up a broad new field of experience for any pilot. It enables him to form valuable acquaintances, to improve his ability if he is a young pilot and it is the best way on earth to get an all-expense-paid tour of the U.S.A. END



"Aside from that she's a pretty reliable little airplane."

Jet Ride

(Continued from page 19)

off an automobile almost instantly.

Jet engines require scant warming up, and after what seemed a brief runway check with canopy closed, during which more colored lights blinked, we were cleared for take-off. The pilot asked me if I was ready to go. Recollection being correct, I answered, "A-men."

Out onto the long ribbon of cement we slithered. The throttle eased forward and the sound rose to the intensity of a typhoon blast. Faster and faster. Then we were off—and with that banana peel sensation!

If there ever was greased lightning, this was it. The altimeter needle began winding and in the matter of seconds indicated 3,000 feet.

Within the pressurized cockpit, breathing seemed to become easier. In fact, the extra oxygen gave a feeling of well-being and high spirits, entirely pleasing. I winked at the yellow blinker and it winked back cordially.

In a few moments another look at the altimeter showed us at 12,000 feet and the hand still winding up.

There had been a swishing sound behind us since take-off. At 20,000 feet Captain Thompson leveled off and checked out of the base control zone. Then the T-33 really got into stride and we sliced into a silent world, leaving even the whistle of the motor behind.

Down between domes of clouds the panorama of Orlando had been spread for a few moments. Now Lake Apopka was coming into vision directly below. A few minutes would have put us over the west coast of Florida. Instead we turned south and east again, the pilot evidently desiring to stay over the center of the state.

One had the sensation of being suspended in a strange liquid medium of smoothest tranquility. Only when the airplane approached a wisp of cloud could the great speed be realized.

Conversing over the inter-com system became easier. I asked the pilot whether I was reading the airspeed right.

"We're making about 580 miles per hour just now," he replied, "and outside the temperature is several degrees below zero."

In the cockpit the temperature was comfortable and the panic light was behaving nicely. Suddenly I wondered just what I had heard through the earphones. Again it came. The pilot was asking me if I wanted to fly this critter.

"Oh-Oh," I thought. "There'll be trouble now!"

Through the earphones came the words, "You have it. Go ahead; it's all yours."

So it was all mine!

Looking around at the distant horizon—both sea coasts would have been visible had it not been for clouds—I decided it was up to me to do something. Accordingly I breathed forward gently on the stick. We lost 1,000 feet. Easing back on the stick netted 2,000. Anyhow, I had got back more than I put in.

"About all you have to do is think where you want to go," Captain Thompson was saying. "These are sweet flying airplanes, very responsive. They control easily. Make a gentle turn to the left and don't use rudder."

I made an easy turn to the left and then to the right; after that several more. The ship flew beautifully and I was beginning to get the feel of the controls when Captain Thompson switched the booster off and it was necessary to fight for every inch of control against the actual pressures.

When the booster was operative again, I asked if I could put the ship into a climb.

"Go ahead," came the reply. "Do what you want to."

Easing back more firmly on the stick put us up 3,000 feet and into stratified clouds. Suddenly there was no horizon—and that was the end of the business for me.

"Here, Captain," I said, "here's an airplane for you. It's one more than I need."

Captain Thompson got us out of the soup and I left the rest of the day's maneuvers to him. I had demonstrated to myself that I was too hot a pilot for even a T-33, and the wisest thing was to leave the birdie to someone who could handle it.

Gear Problem

For several minutes we cruised and listened to a cadet in the approach pattern over Pinecastle. He was having trouble with a landing wheel which stuck in up position. Calmly and precisely the tower instructed necessary procedure and finally ordered the flier to come in low over the runway and bounce the down wheel on the cement landing surface. This was to jar the faulty wheel into position and cause it to lock. After a couple of trys, the cadet, who wasn't saying much now, got the wheel down in place and properly locked. Thereupon he proceeded to make a satisfactory landing.

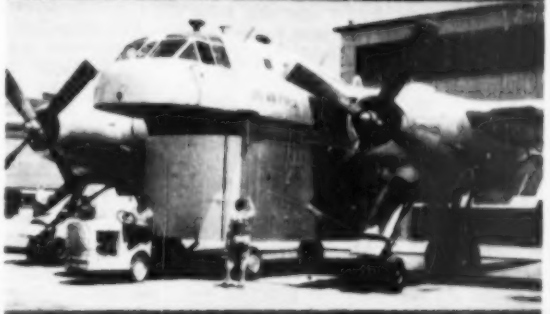
Our flight was nearing its conclusion, and soon we were descending in long turns to the west of Pinecastle. Kissimmee, almost 15 miles away, is nearly under the landing pattern.

Finally we were down near the field and receiving directions from the tower preparatory to landing. In a final beautiful banking turn, almost vertical, Captain Thompson brought the sleek craft around in line with the runway and landed without a jar or semblance of a bounce. Soon we were far up the runway and turning off onto the parking area.

Thus ended a flight I would never forget; and, too, I would long remember the excellent and considerate pilot. What had been a rare experience for the passenger is simplest routine to these men who ply their trade in a strangely quiet, blue world of their own. END

SKY TRAILER

On the road, Fairchild Aircraft's new Sky Trailer resembles its highway counterpart as it rolls along on truck-type wheels with its front and rear cargo doors folded. At the airport, the detachable cargo compartment is hoisted into position under the Fairchild XC-120 *Pack Plane*, minus its wheel assemblies and streamlined for flight by opening the cargo doors to form a modified V-shape configuration fore and aft. Aloft, the Sky Trailer looks like an integral part of the plane. On landing it will be detached, the wheels remounted, and the trailer will be ready to roll again.



JATO-the Magic Bottle

(Continued from page 25)

motor proved to Navy that JATO was the answer. The decision by Navy to use JATO soon had the Aero-Jet outfit humming again.

Since 1943, when the first units were produced in quantity, thousands have been used throughout the world by the Armed Forces and commercial airlines. The story of the magnificent job done by JATO in World War II would fill a volume. One airline which operates from the La Paz, Bolivia, airport, which is 13,400 feet above sea level, can carry only nine passengers in a DC-4 when taking off from this high-altitude field. With the help of two JATO units the same airplane is allowed to carry 29 passengers.

The standard JATO unit being supplied to the Armed Forces and the airlines today is approximately 36 inches in length, and measures 10 inches in diameter. In configuration it resembles a 250-pound bomb minus the fins. Fully charged, the unit weighs 200 pounds. Empty weight is about 120 pounds. The chamber body is spun from a seamless steel cylinder, threaded at the forward end to engage a closure cap which must be removed when the unit is recharged. The aft end of the cylinder is drawn into a hemispherical shape and contains the discharge nozzle, the igniter assembly, and a safety valve which protects the chamber body against excessive pressures during operation. Three lugs welded to the cylinder permit attachment to the airplane structure in much the same manner as a bomb. The entire unit is of basically simple construction, and since it contains no moving parts, requires no lubrication or maintenance.

Oxidizer and Fuel

The propellant for JATO consists of an oxidizer and a fuel, blended in proportions necessary to provide complete combustion. The fuel is a mixture of two asphalts and a parafine base motor oil. The oxidizer is potassium perchlorate, and serves as an available source of oxygen. The mixture is inert to shock and slightly thermoplastic. Temperature changes do not affect the operation of JATO. The propellant will burn safely at temperatures between minus 10 degrees fahrenheit and plus 130 degrees fahrenheit. The presence of the oxidizer makes the JATO motor completely independent of the medium in which it operates for the oxygen necessary to support fuel combustion. For this reason JATO will operate satisfactorily at any altitude.

The average aircraft battery system is sufficient to fire the JATO unit. Various tests made under the most severe conditions have shown that the unit will operate on as little as four amperes. An electric wire attached to the igniter assembly runs to a switch in the pilot's compartment and then to the aircraft battery circuit. Closing the switch causes the primer charge, located in the igniter assembly, to burn, which in turn sets off the igniter charge. When the igniter charge reaches its auto-ignition temperature of about 575 degrees, it causes the propellant to burn, and when the proper temperature has been reached the rocket is in full operation. The entire sequence, from closing the switch until the rocket reaches full thrust, takes less than one half second!

JATO units being delivered to the Air Force and the commercial airlines are designated 14AS1000, which means that the unit has a duration of 14 seconds, is of the solid propellant type, and uses an asphalt base for fuel. It will produce 1,000 pounds static thrust at sea level. This is equal to about 400 engine brake horse power at 115 mph. The complete unit sells for $203.50, and you get a $36 refund when the empty cylinder is returned for recharging. JATO units may be recharged as often as needed. Cylinder chambers are inspected before each refilling operation.

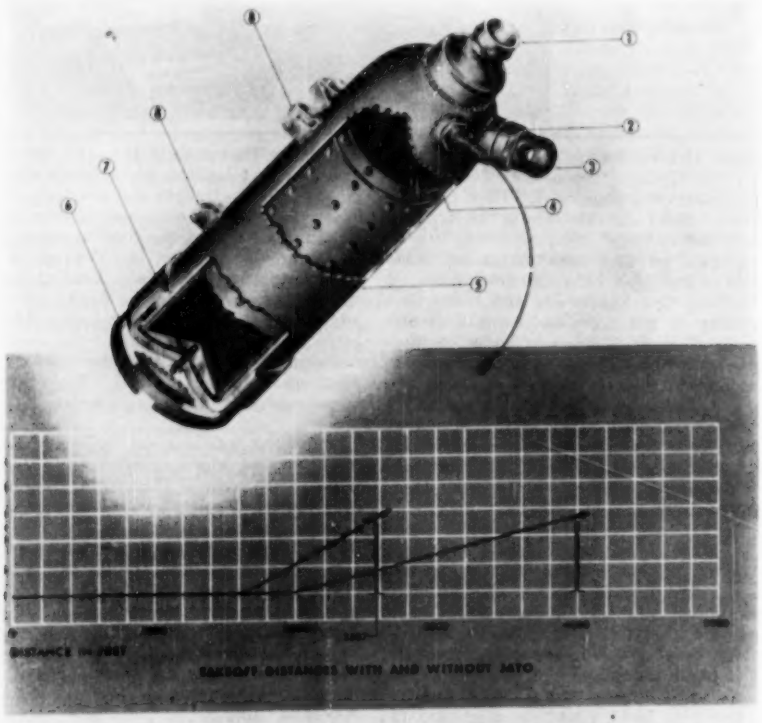
Newton's Third Law

To understand fully the principle of rocket propulsion you have only to refer to Newton's third law of motion which states that for every action there must be an opposite and equal reaction. When gases confined in a chamber under pressure are allowed to escape through an orifice or nozzle at high speed, an opposing force is exerted upon the chamber. Attach this chamber to an airplane and rocket propulsion is achieved.

The private flyer hasn't been forgotten by the Aero-Jet people. A junior size JATO unit under development for some time has been successfully test flown on a North American *Navion*. The small unit, known as "JATO JUNIOR" weighs only 55 pounds and develops about 50 hp at 75 mph. JUNIOR is classified at the present time and cannot be released for public use. When the international situation warrants, the Aero-Jet outfit hopes to make the JUNIOR unit available to everyone, and at a price everyone can afford.

Although there are numerous applications for JATO, the most important is still to augment the power of the reciprocating engine. In event of engine failure during take-off, whether in a heavy transport or a single engine lightplane, JATO in most cases will allow the pilot to clear obstructions and maneuver the airplane into an open area, or land back on the field from which he took off. JATO power can also be used to compensate for errors in judgment, speed, or distance which might occur during the excitement of a forced landing.

If and when world conditions settle, JATO is one of the good things to which all aviation folk can look forward. END



Cutaway View of Aerojet Model 14AS-1000 JATO Rocket Motor

1. Nozzle assembly
2. Igniter assembly
3. Safety pressure release assembly
4. Propellant cartridge
5. Chamber assembly
6. Ring-stand
7. Forward closure cap
8. Attachment fittings

OPERATORS' CORNER

National Aviation Trades Association (NATA) is a service group that represents all service segments of the airport, fixed-base and air service operator. Its staff represents a federation of State Chapters and Members-At-Large. Its purpose is to fountainhead all activities of the American Operator, and to act as a sounding board for better public relations. Its aim: to improve air service operations and promote greater aircraft utilization.

Headquarters are located at 1346 Conn. Ave., N. W., Washington, D. C. Members receive a monthly "Washington News Letter" of confidential legislative and policy news in the making.

National Air Taxi Conference, same address, an affiliate of NATA, represents operators engaged in perfecting and standardizing a system of "through" air transportation.

Opinions expressed in this column are not necessarily those of FLYING Magazine.

New Air Taxi Zone Rate

Meeting at Los Angeles late last year, the National Air Taxi Conference voted to adopt a zone rate for air taxi trips in continental U. S. based on six 25-mile zones. Applicable in *Bonanza*, *Navion*, Cessna 190 and Bellanca type aircraft, the rates set up were $15, $20, $30, $40, $50, and $60 for the six zones respectively. Rates are dependent on CAB approval and, in some cases, state approval.

NATC dues for the coming year were set at $100 (an increase of $20) and requirements for membership were tightened slightly to give the executive committee more authority over applicants and assure that only responsible operators with high standards were eligible.

By unanimous vote the NATC's executive committee was continued for another year with Samuel Freeman (N. J.) as president, Walter Laudenslager (N. J.) 1st vice president, and Fred Tobey (Mass.) 2nd vice president. It was decided to appoint a committee of seven regional representatives, one for each CAA region, in order to boost membership and give NATC members better nationwide representation.

Medal of the Month

If anyone is giving out medals for business promotion, one should go to Sky Ranch Flying Service, Denver, Colo., for its deal with LeRoy Shockey, gas station operator. Shockey offered a free airplane ride to all motorists buying a tankful of gas. He reported a quadrupling of business; 250 customers went flying. What angles have you used to stir up 250 additional enthusiasts? Sky Ranch's cost was offset by charging 50 cents a head on extra passengers.

Aviation's Loss

Martin J. Burke, chairman of the Aviation Committee of the Los Angeles Chamber of Commerce, reports that in 1940 they had 57 airports in the metropolitan area; now there are less than 20. More are slated for extinction. Down in Miami, Fla., beloved Sunny South Airport is being subdivided. This is a familiar pattern in American cities. It would seem that more State Aeronautics Commissions could follow the lead of the outstanding Oklahoma Commission which really promotes aviation in all its aspects. The CAA has done much to solidify the big airport picture—why not a little concern for the grass-roots of aviation? NATA's Washington office, incidentally, took a long shot at the Los Angeles County Board of Supervisors on the whole matter in that area and stated a strong case on general aviation and the reason and need for smaller airport retention and development.

Dusting Data

Operators who constantly seek improvements in dusting technique may be interested in Herb Rayner's conclusions. Operating for several years out of the Stuttgart (Arkansas) Airbase, he is discarding the trusty Stearman in favor of J-3 *Cubs*. His latest wrinkle suggests leaving the bottom cowl off the airplane for better cooling. It has been found that a 65 hp Continental with stellite exhaust valves and a 70-40 McCauley propeller will stand up better than the C-85's. Also, the latest trend is toward a simple canvas bag hopper instead of fancy boxes. It seems to feed better, one can tell how much is in it and maintenance is simple. As a last tip, he suggests cutting the turtle-back off from wing to fin, and mounting a plywood loading platform just behind the trailing edge of the wing.

Do You Know?

Light aircraft now outnumber the combined U. S. airline fleet by 42 to 1 and in 1951 flew nearly 8.5 million hours —triple the estimated total flown by the commercial passenger and cargo carriers.

Farmers, ranchers and executives last year flew 2,952,000 hours, an increase of 19 per cent over 1949. Dusting, seeding and spraying operators flew 51 per cent more in 1951 than in 1949.

Private aircraft for hire (passenger, cargo, charter and air-taxi services) flew 13 per cent more hours.

Industrial use of private aircraft last year amounted to 403,000 hours; civil pilot training accounted for 1,902,000 hours; and planes operated by federal (non-military), state and local government agencies and the Civil Air Patrol flew some 135,000 hours.

—Ed Hoadley

MISS NATA (Miss Lee Wilson of Beverly Hills) greets new president at NATA convention in Hollywood. Left to right: John Griffin, from Boston, NATA vice president and chairman of 1953 Steering Committee; Robert Northington, from North Carolina, retiring president; Miss NATA; Harland Herrin, from Helena, Mont., new 1953 president.

Flights into the Past

(Continued from page 29)

and subsequent excavations, the workers from the Ashmolean found an ancient *cursus* of undetermined age and use, and some related circles. Everything promised by the photographs had been there.

Much more dramatic are pictures of the hill forts or ruined walls of old buildings. Such features, having depth, show in strong relief on oblique pictures taken when the sun is low. If anything can stimulate one's imagination at every view it is these great ringed hill forts and camps cut into the hilltops about 2,000 years ago!

Equally exciting are the hill figures—designs cut into the hillsides of England and other countries (including the southwestern United States). In England, almost all are on the chalk slopes of several southern counties, notably Wiltshire. There has been much disagreement about their age, especially that of several crosses. Two large giants are probably older and a number of horses are known to be several hundred years old, at the very least. The turf has been completely cut away, exposing the white chalk to make a very spectacular picture on the landscape. Understandably, some of the figures are modern: a kiwi made by New Zealand troops in World War I, a few of the horses, and a very well known lion close to Whipsnade Zoo.

War Blackout

During the last war it was feared enemy airmen might use these bright and prominent landmarks for navigational purposes so they were carefully covered with turf, brush and perhaps paint. Now they are all brightly white again, for all to see.

During the war an enormous number of aerial photographs was accumulated, complete cover in many cases, not just random pictures. Archaeologists are now sifting them out and it is from these pictures (and those taken to follow them up, when a site looks promising) that much new knowledge will come during the next few years. Already, notable discoveries of both Etruscan and Roman remains have been made in Italy from them.

The small size of Great Britain, compared to the United States, adds to the interest there, for all its history is so greatly compressed. Every mile has its stories. There is always something to see, from the air as well as on foot. Don't ever let anyone tell you the flier goes along too fast to see landmarks, provided he has good maps and knows where he is and wants to see things.

We pilots may study and enthuse but it takes real experts to interpret our findings. Maps need to be checked and information correlated. Otherwise, that lovely enclosure may be a modern fish pond, or that straight, faintly outlined—surely Roman!—road may be a disused railway. Both of these mistakes have actually been made. But it is fun and, certainly, an unending study. END

A FLYING TIP

Be careful where you place an exposure meter in your airplane unless you want to pull a wrong-way Corrigan act. Never lay a photographic exposure meter on the ledge above the instrument panel (though this is a temptingly convenient place for it) or anywhere near the magnetic compass. An exposure meter contains a magnet which will affect the compass and may swing it as much as 120° off course. The amount of deviation depends upon the heading you are flying and which pole of the magnet is nearest the compass. The type of meter and the distance between meter and compass are also deciding factors.

Skeptical? Just wave an exposure meter around near your compass and watch it spin.

—*Alice S. Fuchs*

Stormbird

(Continued from page 21)

among them General Galland, ace German fighter strategist. Galland was greatly impressed and desired immediate production but the Junkers turbojet engine still had bugs and production of the Me-262 A-1 was held up until March, 1944, one year before the war ended.

Meanwhile Junkers had not been idle. No sooner had the .004B engine reached the construction stage than they began on the C model. This had hollow, air-cooled turbine blades (as had the BMW .003A) and a static thrust rating of 2,220 lbs. against the 1,980 lbs. of the B and the eventual 1,850 lbs. of the A model (only 40 of which were built). The .004C was actually conceived in late 1942 and flight tested in the Arado-234 prototype fighter-bomber in early 1944.

It was from this powerplant that the long line of models of the Me-262 evolved—fighters, fighter-bombers, bombers, trainers, reconnaissance, night fighters and interceptor types—in all, seven different uses and about 15 models, many of which had flown by the end of the war. Though most of these were to have used the Ju .004C jet engine, it flew only experimentally and did not reach quantity production. All Me-262's used in combat were, for this reason, powered by Ju .004B's.

From the basic high speed fighter version, Me-262 A-1, 11 models, laid out in 1943, were to form the backbone of future development of the plane. It was never believed that all of these would reach production, their purpose being to exploit the potentialities of the design to the fullest. It was probably the Germans' intent to fly most of them experimentally. These models are listed in Table I with their estimated design performance.

Change in Plans

The Me-262 A-1 began to reach squadron service in the spring of '44, at a time when American daylight bombing was blasting German industries. It was the hope of the Germans that the *Stormbird* with its four MG 108 30 mm cannon, fighting alongside the Me-163, would bring Allied strategic bomber attacks to a halt by increasing bomber losses to a prohibitive figure. Before this could be realized, the invasion and Allied use of tactical aircraft in large numbers altered operational plans for the Me-262.

American and British fighter-bombers, supporting invasion, cut every railway and highway leading to the beachhead, maintained a line of interdiction in advance of Allied troops and destroyed everything which moved on a German-held artery.

Hitler, dismayed by the advance of the Allied armies under their umbrella of air power, ordered the Me-262 converted to a fighter-bomber, over the strong protest of Goering. This was a major mistake of the German high command. Against 1,000 daylight bombers, 100 jet fighters would have been a calamity. Against several armies spread over an ever-widening front, 100 jet bombers could scarcely be more than annoying.

Hitler's order resulted in (1) the conversion of many Me-262 A-1 fighters to Me-262 A-1A fighter-bombers with two 30 mm cannon and two external 550-lb. bombs mounted under the fuselage; and (2) the planned production of the Me-262 A-2 with armament increased to six MG 108 cannon, the same bomb load, and using the Ju .004C jet. The production version of the latter, using the Ju .004B since the C was not yet available, was actually fitted with only two 30 mm cannon to enable it to match the performance of the A-1.

Also from the basic A-1 airframe were developed the A-3 bomber and the A-5A reconnaissance planes. The A-3 was to carry the same bomb load as the A-2 but featured a prone bombardier in the nose to improve bombing accuracy. The A-5A had cameras in the nose replacing the guns. Neither was built, although some fighters were used as reconnaissance planes. The fighters were also used with devastating results against Allied photo-reconnaissance planes.

By January, 1945, Hitler was finally convinced of the potentialities of the Me-262 as a fighter and most bombers were turned back to the fighter units. It was then too late to stop the strategic air offensive of the Allies, since Germany as a prime target was already nearly destroyed.

Training Version

The first major change in the basic airframe was in the Me-262B model. Early in the summer of 1944 it was recognized that a training version, capable of carrying an instructor and student, was necessary to overcome the high non-combat losses due to inadequate pilot training as well as to frequent powerplant failures. The cockpit was enlarged to the rear for an extra seat and the rear fuel tank decreased. This B-1 trainer was generally unarmed though it could be fitted with up to four MG 108 cannon.

By adding radar in the nose and an operator in the rear cockpit, the B-1 became the Me-262 B-2 night fighter which

was used very successfully in small numbers in the closing months of the war against British night bombers. Some Me's were fitted with two upward firing fixed guns and thus able to fly under the British bombers which no longer had belly turrets.

The third of the 1943 models to be built, the Interceptor I (or Home Defender I) was designated Me-262 C-1. It featured a Walter HWK-RII/211 liquid fuel rocket of approximately 2,500-lb. thrust installed in the tail just below the rudder with two Ju .004C jets in the regular position. An altitude of 39,000 ft. could be reached from a standing start in 4.5 minutes, a rate of climb exceeded by only one service interceptor, the Me-163B. The Me-262 C-3 was to have the rocket mounted externally under the rear fuselage but was never built. Armament of both was to be six MG 108 30 mm cannon. An external tank housed fuel for the rocket engine.

As soon as the BMW .003R was available, it was fitted to the *Stormbird*, this model being the Me 262 D-1, or Interceptor II. The BMW .003R consisted of a standard .003A-1 with a BMW 109-718 liquid fuel rocket of 2,750-lb. thrust fitted above the 1,760-lb. thrust turbojet orifice, increasing the available thrust by 156 per cent. Armament was the same as the C-1 with rocket fuel housed in the auxiliary tank and forward engine nacelles.

The 65 per cent weight increase of the Me-262 C and D over the previous models brought a new problem and an ingenious solution. Since the two main tires would no longer take the terrific load, two additional main wheels were mounted beside the originals. On the Me-262 C-1 these were jettisonable after take-off and the plane, lightened after its mission, landed on the original gear. The D-1 retracted the dual wheels into a space in the fuselage normally occupied by a fuel tank. It was the last Me-262 designation assigned prior to the German collapse.

Defensive Trend

Both of these interceptors were flown experimentally in 1944 and only the end of the War prevented them from seeing action. They illustrate the trend of the German Air Force during the last year of the War to purely defensive weapons, designed to combat the high altitude daylight bombing that was obliterating the industrial power of Germany.

Along with the Bachem Bp-348, the Me-163, the Ju-248 and the He-162, the Me-262 C and D formed the backbone of the German defensive air arm during late '45 and '46. Had war continued another year the pendulum of air superiority undoubtedly would have swung away from the Allies and a stalemate arisen—the Germans lacking bombers and the Allies unwilling to risk their bombers against superior German fighters.

The development of the *Stormbird* continued in the Interceptor III. This version, which was flight tested, dispensed with the turbojet engines entirely and was fitted with two Walter HWK-RII/211 rockets mounted in the same position in streamlined nacelles slung under the wing. These units of 2,500-lb. thrust had a "cruising" combustion chamber in addition to the regular high power one (a feature also of the Me-163 C and Ju-248 powerplants) and gave a performance somewhere between the Me-163 B and the C. The small combustion chamber was used for normal flight at moderate speeds and the regular one was cut in for combat.

Later models of the 1943 group which were never built were the Fast Bomber and Reconnaissance series, none of them fitted with guns. The early versions of these were fairly straightforward developments of the Me-262 A-2. The Fast Bomber I differed in having more fuel in place of the nose guns, as did the Reconnaissance I, fitted also with two cameras.

A completely new nose with a forward cockpit, fitted on the Fast Bomber Ia, changed the appearance of the craft greatly. The load of two 550-lb. bombs was again carried externally under the fuselage. Its photo-reconnaissance counterpart, the Reconnaissance Ia, had two cameras in the rear fuselage. All these used the double main wheel gear.

The terrific drag of the external bombs, causing an estimated 125 mph loss in speed in the early Fast Bombers, was overcome in the radically redesigned Fast Bomber II. It featured a broadened fuselage with a bulbous, drooping nose and an enlarged vertical tail. The bombs were housed internally in a forward bay along the fully retractable dual-wheeled gear and extra fuel tanks. Increased frontal area gave a lower maximum speed without bombs, but the overall reduced drag on the outward leg of a mission resulted in greater range.

Advance Models Tested

Again, this model had a counterpart in the Reconnaissance II which utilized the greater volume for more fuel and an extra nose camera. Models of both series were fully tested in Germany's high speed wind tunnels long before the end of hostilities.

In late 1944 the first experimental Heinkel .011 jet engines became available and were fitted to a modified version of the Me-262 B-2 night fighter. The 2,860-lb. thrust of this jet gave a much higher climbing performance. All the later models of the Me-262 were limited in maximum speed to about 560 mph at high altitude by their critical Mach number. For this reason the extra power was generally available only for climbing and maneuvering and engines had to be throttled back in level flight at that height. At low altitudes, where higher sonic speeds prevail, the fighter reached 625 mph in dives.

To overcome the Mach number problem the Germans planned to go to a swept back wing and tail configuration. By 1940, they had discovered the advantage of this design in delaying compressibility troubles. (The Allies, through the NACA, did not find it out until 1945.) At least one Me-262 so modified was successfully flight tested. *This fell into the hands of the Russians*, who have continued to develop the design into the La-15 night fighter, now flying in the Red Air Force.

Of the total of about 1,400 Me-262's built, the majority did not reach combat service for various reasons. Many were lost through accidents. Most of the 850 produced in the last four months of the war were destroyed by Allied air attack while immobilized for lack of fuel. Complete disorganization of Germany in this period prevented delivery of others to combat units.

Due to the change in the course of the war from start to finish and the mental processes of Hitler, the Me-262 development was shifted from offensive fighters, fast bombers and reconnaissance planes to defensive interceptor and ineffective fighter-bomber types. This is no reflection on the plane but is, rather, a good example of how flexible a design it was. No other aircraft in the history of aviation has been so radically modified to enable it to conform successfully to different demands placed on it.

Though robbed of its chance to become a decisive factor in World War II, *Der Sturmvogel* will remain one of the great planes of all time. END

"She may be old but you gotta admit she gets off the ground in a hurry."

Radio Had Me Buffaloed

(Continued from page 26)

First look at a sectional air map and mentally cross off all the information you *can't* use (if you have the standard low frequency receiver most of us people of modest means do have).

(1) *Anything printed in blue, you can't use.* It's high frequency stuff, requires Visual Audio Range gear, Omni Range gear, and the like. Naturally, if you own omni or VAR, these blue-printed items are your meat and you will use them to great advantage, but I'm speaking now to pilots who are neither radio experts nor owners of high frequency receiving equipment.

(2) *You can't use the various almond-shaped, propeller-shaped or round-shaped "fan markers"* which appear on the red range legs or alone. To use these you need a special fan-marker receiver.

Having eliminated the stuff you can't use, it now remains to understand *fully* the stuff you can use. To illustrate the point, let's make a test example of the Bethlehem-Allentown-Easton airport, just outside Allentown, Pa. This is typical of all airports of fair size in the nation. Also, it happens to have a directional low frequency range, in addition to its control tower radio facilities. The two facilities are several miles apart.

At Home on the Range

First let's consider the range.

The red-outlined box which identifies the Allentown range contains the following information: ALLENTOWN RADIO, 320, ABL—(plus the Morse code dots and dashes which mean ABL). The word "radio," anytime it appears on a box on a map, means that the facility has voice communication. The number 320 is the wavelength of the range station—the number you tune to when you want to listen to the Allentown beam or talk to the man who operates the Allentown range. Over your radio set they sound like this: dit daah, daaah dit dit dit, dit daaah dit dit. By looking at the dots and dashes in the little red outlined box for the Allentown range, you can easily match them with the dits and daaahs coming over the air. You do not need to know Morse code. Once you've definitely matched them up, you are positive that you are listening to the Allentown range.

Suppose you are flying near the range station on your way to Harrisburg, and would like to know how the winds aloft are blowing so you can pick the cruising altitude with the least headwind, or the best tailwind. If you are using a very-high-frequency transmitter (this you really ought to have because it can be heard so much more clearly by range and tower operators!) you'll find at least two standard frequencies on your set for sending messages.

One is usually marked "range." It is 122.1. This is the one you must use in talking with a radio range. The man down in the range station is listening to this frequency every minute he is on duty. So as soon as you transmit over it, he hears you and can answer you. Assuming you have turned your low frequency receiver dial to 320, in the case of Allentown, you can hear him, and a two-way conversation can take place. In a few seconds he can tell you which altitude will be best for your cruise over to Harrisburg. Simple, wasn't it?

If you are using a low frequency transmitter rather than VHF, then, of course, you transmit on 3105 for both range and tower. All ranges and towers monitor that frequency.

Now let's take a look at the Allentown control tower information, which appears in a red-outlined box joined to the airport by a red line. This box contains this information: ALLENTOWN-BETHLEHEM-EASTON, 392 L H 40, 278 (in red), and 119.1 (in blue).

This means that the Allentown-Bethlehem-Easton airport is 392 feet above sea level, has lighting facilities (L), a hard surface (H), and at least one runway which is 4,000 feet long. The red 278 means that the Allentown tower transmits on 278 to people with low frequency receivers (that's us!). So tune to 278 and you'll be able to hear the tower. Then turn your transmitter away from "range." Turn it to the spot marked "tower." This is 122.5. When you speak into your mike, the tower operator, who is listening to 122.5 at all times, will instantly pick you up. He then talks to you over 278. You can thus obtain full landing instructions.

It Has Happened

However, if you forgot to turn your transmitter from "range" to "tower," the following will occur. The guy in the range shack will hear you. He may think you are calling him, and come on the air. However, he'll be calling you on 320, which is *his* transmitting frequency, so you won't hear him, being tuned to 278. The tower may not call you back at all, unless by chance he happens to be monitoring both the tower and the range frequencies. So the net result will be nothing. You'll send. Nobody will answer.

It is worthwhile mentioning that you can effect a safe landing even though your receiver may be out of kilter, so long as your transmitter is okay. Simply turn your transmitter to "tower"—or 122.5—and tell the operator you have no receiving facilities, and ask him to handle you with his powerful red or green Aldis lamps.- I did this recently in Detroit, and it worked perfectly.

Now to the last number, printed in blue, in the Allentown box. This is a high frequency transmission number. It does not concern you unless you are using high-freek gear.

Now that you are checked out on what the ranges and towers have to offer, you are ready to follow your first beam—to use radio as a means of flying cross country without getting lost. This is duck soup. However, I want to stress again that you must keep track of your position on the ground, by reference to the sectional map, even though you are using radio as a means for navigation. This is not difficult. It is not the old anxious staring at two villages three miles from your last sure checkpoint, and trying to decide which is Dogham and which is Parkins Point. When radio is helping you, you need pay attention only to the larger check points. For example, on the way to Harrisburg from New York you'd want to know when you reached the Delaware River, when you passed over Allentown, and you'd want to make sure you were headed down the valley corridor toward Harrisburg instead of up into the mountains toward Cub Haven. It would be an easy, low-pressure operation, not a feverish pinpointing of every racetrack, highway, and tiny lake.

Now, if you're ready, let's take a practice radio navigation hop from Lancaster, Pa., which is 50 or 60 miles down a range leg from Allentown, Pa.

Climb in at Lancaster, turn on the radio, let it warm up, and tune it to 320. The Lancaster airport is nearly in the middle of the Allentown beam. You will thus get a steady on-course signal the moment you are precisely tuned to 320. At regular, frequent intervals, this steady on-course signal will be interrupted by the Morse code call letters—ABL—which identify the Allentown beam.

Fold the sectional map in a neat oblong, so you can follow the portion of it from Lancaster to Allentown without having it crackling and buckling all over the cockpit. Taxi out and take off. You will notice that there is a definite red edge on the right hand side of the Allentown leg leading from Lancaster. The other edge is stopped short, with no heavy edging. The heavy line identifies the N sector. The other side, with no line, identifies the A sector. This is standard on all radio range legs. The letters A and N no longer appear on the map.

Right-Hand Traffic

Following a radio beam in an airplane is like following a highway in a car. You stay on the right. This prevents collisions.

Fly now off toward your own right to get out of the center of the beam. As you thus angle out of the beam, the steady on-course signal will blur, and a ragged daah dit . . . daah dit . . . daaah dit . . . will presently emerge and be audible in your earphones. This is the letter N. It means you are working out of the beam into the N quadrant. You are now on the right hand side of the road, where you should be.

Now is a time when reference to the map can help you identify your position as being on the right side of the beam, just as a cross check. Take up a heading which carries you along the right hand edge of the beam, toward Allentown.

The best trick I've found in staying on the right side of the beam, not too close, not too far away, it is listen to the range identification signals—ABL—in this case, which come to you at regular close intervals. These signals are transmitted twice. First in the N quadrant. Then in the A quadrant. If you are holding a proper heading, close to the right side of the beam, the two signals will come to you with the same volume and intensity. Just keep them that way, and you are riding

(Continued on page 50)

AOPA MEMBERS GET TOPS IN WASHINGTON REPRESENTATION

AOPA Member A6605

HOLLAND PAGE, Jr. *Says*

"Permit me to offer my thanks and congratulations to the officers and staff of National Headquarters on the excellent representation given the membership of AOPA before the various Government departments and committees. Our nation can ill afford the loss of private and non-scheduled aviation to the Defense Program as well as Civil Defense through illogical and unrealistic regulations."

The photograph at the left shows member Page and his wife, famous Tony Page, noted aviatrix, aviation writer and AWA member, posed against Holland's Beech Bonanza, N3210V.

Holland Page, Jr. took his first flying lesson in the early 30's and purchased his first airplane, an Aeronca Chief, in 1938 after he had been flying for some time. Holland operates an Insurance Agency and from the start has used his airplane to service the insurance requirements of his clients. Prior to the war, he did some work for CAA as an Airways Traffic Controller. During the war, he served with the AACS (Army Airways Communications Service) with principal duty in the China-Burma-India theater. After leaving the service, Holland resumed his insurance business and says, "A flying insurance man, I am today."

To date has logged over 3500 hours and holds a ticket with Single and Multi-Engine Land and Single-Engine Sea Ratings. Holland is also a past president of the Texas Private Flyers Association which is composed of over 500 private airplane owners.

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for those pilots who do not require the full services of the AOPA due to their flying inactivity, military service or other circumstance, ***Regular Membership*** is available at the low rate of $5.00 per year. This plan is ideal for those pilots whose servicing requirements are limited but who wish to support and be affiliated with AOPA. Benefits are limited. Member will receive standard lapel pin, membership card, the AOPA edition of FLYING magazine each month, and may participate in insurance available through AMERICO and the Minnesota Mutual Life Plan. (Automatic personal accident policy issued at no cost to ***active members*** is not available to regular members, nor is the AOPA Washington Newsletter.)

FLYING FARMERS

By BILL RENSHAW

SAFETY vs. CARELESSNESS

Flying Farmers of Indiana and Illinois have set a safety versus carelessness record which they are ashamed of on one hand and proud of on another. In 1951 not a single aircraft fatality was reported among the more than 3,000 members.

In the same period seven of the 3,000 lost their lives in farm accidents, with four of them being crushed to death beneath farm tractors.

While the 1952 farm accidental death figures will not be available for almost a year, we do know of at least three midwestern Flying Farmers who have lost hands in corn pickers or field choppers this fall. All three of these FF's had flown many hundred hours without an accident of any kind.

This is the first time we have ever admitted that "branding" an airplane as a dangerous machine might have some virtue. Is this Flying Farmer aircraft record good because they respect and fear an airplane? And is the farm accident record bad because they have no fear of a slow moving tractor or a "perfectly harmless" bull? We confess we don't know, but we think maybe we've got something. What do you Flying Farmers think?

* * *

FRIENDLY FARMERS

"Operation Friendship" is another Flying Farmer project with a great potential for good.

First suggested by Joe McLaughlin, thorough-going Director of Aeronautics for Illinois, the plan calls for Flying Farmers to take into their homes officers and cadets from foreign countries for a week end of fried chicken, pumpkin pie, plus an extremely generous helping of rural hospitality and Americanism.

To date many hundreds of these officers and men have been flown from Chanute Air Force Base to central points, where they have been picked up by Flying Farmers.

After a week end, Flying Farmers have returned their guests to the pick-up points thoroughly convinced that the formula for a peaceful world is an intermingling of the people of the world.

Said Walter Kimble, secretary of Illinois FF's, "It's impossible to tell who gets the most good out of 'Operation Friendship,' the farm families or our foreign friends."

* * *

QUIZZING THE "WINGS"

Flying Farmer organizations seem to be like most clubs—they must have interesting events at frequent intervals or they wither and die.

Recently we asked Flying Farmers across the nation if there was anything seriously wrong with their state "wings."

The response was overwhelming. In most every letter the lack of well-planned activities was cited as a major cause of deterioration.

Running a close second in a half dozen states was the complaint that "our organization has gotten away from the original down-to-earth flying farmers." In a couple of states, the writers said "too many business men and dude ranchers are being let in."

Without solicitation, several of our correspondents have added, "If you go to the National Convention, better take a pocketful of money. You'll certainly need it."

On the latter complaint we are convinced that the National FF Association is making a real effort to hold convention living costs to a minimum.

Prices were way out of line at some of the early conventions. The association was suffering from growing pains and mistakes were made. Profiting by those mistakes, the current leadership is, we believe, well on the road toward a sound policy and a constructive program.

More than two-thirds of the states we heard from offered no criticism of their state "wings."

* * *

OBSTACLES DOWN UNDER

The yearning to fly prevails among farm youth the world over. The greater the obstacles, the more pronounced the desire. Recently we've had letters from several young men in Australia, all aspiring to become Flying Farmers. One pilot, A. O. Lewis of Jordan Avon, Jericho Queensland, Australia, compares the hardships he has undergone to get his ticket, with what we think is tough in our U. S.

After soloing in a Tiger *Moth*, Lewis says he had to give up flying for a while because rates were prohibitive. Learning later that a training plane was available some 350 miles away, Lewis "hopped up" his motor bike and set out for what to him sounded like the promised land.

It took him 14 hours to traverse the 350 miles of dirt road but it was worth it, as he got in 14 hours of flying before he had to return home.

Later Lewis took a job helping with the "wheat planting" in New South Wales. Here he got in 50 hours of flying, but missed getting his license by five or six hours. "Today," he concludes, "I am at home 500 miles from a training plane." However, he is not giving up because of the obstacles. "I am," he says, "saving about five pounds per week, all of which will just about pay for one hour of flying, to say nothing of a hotel room which costs about 10 pounds per week in any town having a Flying Club."

We conclude this item with one of the first sentences in Lewis' letter. "I was," he says, "reading some letters in FLYING Magazine complaining about the high cost of flying, so I thought some of my experiences might cheer the writers up."

Thanks, A. O., you've helped us to see just how fortunate we are.

(Continued from page 48)

the beam edge to perfection.

If, however, one of them gets weaker, you are drifting away from the beam, and must turn back toward it until they are again of equal intensity. If you begin to lose the N signal, and start getting a steady on-course hum, then you are drifting over into the middle of the road again, and must turn to your right.

The process just described is actually all there is to riding a beam in good weather: first you identify it, then you get on it, then you get over on the right side of the road and keep listening to the call letter sequences. Keep the two of equal volume, keep a general check on the ground, and very soon you'll find your destination coming into sight ahead.

I personally like to keep a close enough check on the ground to ascertain by visual reference when I am in the neighborhood of my intended destination, rather than wait until I get over the range station. It's true that just before you reach a range station you get a terrific build-up in volume, which falls off almost to nothing in the so-called "cone of silence" over the station, and then builds up in a surge after you've passed over. But this sort of thing can be confusing. Anyhow I like to be free to observe the traffic conditions around the field, and get myself oriented generally, before I switch over from "range" to "tower" on my transmitter and call Allentown for landing instructions, having, of course, tuned my receiver away from 320 and onto the tower's 278 frequency.

Going away from a radio station, the technique of following a beam is the same. You stay on the right, keep the call signals equal in volume, and watch the ground from time to time, to double check. Getting onto a beam from any spot in an A or an N quadrant is simple. You just fly toward the beam, wait till you get an on-course signal, then jockey over to the right side and go merrily on.

There is one thing I must warn you about. To use radio the simple way, you *must* know where you are starting out. You *must* know positively in which quadrant you are. Otherwise all bets are off, and you can get hopelessly and completely fouled up in no time at all. If such is the case, and there's a good field under you, it's better to land and ask than fly onward and hope. END

Cub to Panther

(Continued from page 15)

skill necessary in obtaining good hits is very little. In 20 minutes, if a flight is properly led, a division can expend its full load of ordnance and be heading home for another load. This is made possible by the speed, maneuverability and versatility of the jet. The steep runs from high altitudes give you the advantage of being tough to hit.

The jet can also be used successfully alongside or in the same type flight as the prop jobs. Oftentimes both jets and props would be working over the same target and the jets, by tailing in behind the props, could maintain a proper interval and get rid of their load behind the slower aircraft. This was accomplished many times by us and added up to much wider use of the jet than would normally have been possible. We could do this by using our speed brakes and diving from a higher altitude than the U-birds.

The Marines try to be perfectionists at everything they do, and close air support is no exception. Terrain and weather conditions made the Korean conflict a far cry from the target areas that we had been using in the States. However, thanks to our training, the poor conditions were used often to good advantage and the only ones suffering were the Communists.

Close Air Support

Close air support is the use of aircraft carrying rockets, bombs, ammunition or napalm in support of troops in taking an objective. It is sometimes referred to as airborne artillery and is used in much the same manner. Usually a pilot, known as the Forward Air Controller, is on the ground with the troops and is equipped with the same radio that the planes overhead have. On his shoulders rests the responsibility for the success or failure of the mission.

The Forward Air Controller may also be airborne, circling our troops in a light observation plane, and from that vantage point he directs the placement of the lethal load carried by the fighters.

The flight leader of the circling fighters takes his orders from the Forward Air Controller and makes the actual strike on enemy forces in view of friendly troops and oftentimes as close as 50 yards to our own front lines. There are tricks used as in any game to assist our boys on the ground which, like any experts, we like to keep to ourselves.

Close air support was used by us in the latter stages of World War II but then we had not perfected it. I flew SBD's in the Bismark Archipelago and later in the Philippines and we were just beginning to use, with extreme caution, close air support. One mission we ran in the Philippines was hitting some Jap tanks on Nichols Field below Manila, and the Army we were supporting on the ground at the time thought we were plenty close to our friends who were over a mile away.

Accuracy Above All

Such a mission in Korea today would be called deep support or at least not the

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APPROVED FOR VETERANS

AIRCRAFT INDUSTRY OFFICIALS PREDICT A GREAT SHORTAGE OF ENGINEERS and the situation will become more serious. There are fewer engineers—and enrollments in engineering schools are diminishing. 50,000 graduations in 1949 & 38,000 in 1950 have dropped to 26,000 in 1952, covering all phases of engineering in all fields. Students should consider engineering as a way of serving their country and at the same time preparing themselves for a career cram full of opportunities—In our scientific age there will be an ever increasing demand for engineers.

✔ **FRANK R. SEERY, NORTH HOLLYWOOD, CALIF.,** says: ... "employed in engineering 3 years ... enrolled at Cal-Aero 1948, graduated 1950 ... immediately employed by consultant engineering firm, at salary considerably greater ... than prior to my enrollment."

✔ **ROBERT A. OLSON, GLENDALE, CALIF.,** says: ... "3 months since I graduated from Cal-Aero ... no previous engineering experience ... well satisfied with my job ... base pay is over $350.00 per month ... it's by no means tops as there are opportunities opening up."

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real close air support that our front lines have become used to since the invasion of the North Koreans into South Korea. Close air support boils down to these few fundamentals required from a pilot. You've got to know where you are—where our lines are—and where the enemy is. It's got to be definite, no guess-work or maybe. You must be able to hit where you are supposed to—there can be no scattering of bombs and napalm around the countryside. Accuracy is foremost and, of course, positive two-way communication must be maintained between all planes in flight and the Forward Air Controller.

The missions which we flew against the Commies in Korea generally fell into two classes—close air support or armed "recky's." An armed "recky" takes place deep in enemy territory and is nothing more than hunting choice targets and hitting them once they are found. We in 311 had a certain area in which to seek out the Commies, and after a while of searching over the same roads you get to know them nearly as well as the back roads in your home town. The Communists are masters at hiding and it taxed our imagination quite often to find their newest methods of camouflage.

One day after a rather fruitless period of searching, Johnny Lindly and I unloaded on a likely looking warehouse and headed back since our fuel was getting on the return home side. As we were climbing for those favorable winds aloft we happened to spot a vehicle on a cliff road heading up. We swung around but were unable to get it on fire or do it any apparent damage. It was a halftrack apparently empty heading toward the front lines about 100 miles away. Johnny and I returned home and reported our "recky" as being quite without significance.

The next day Johnny and I were in the same area and decided to have a look-see at our halftrack. We got down low and came sneaking along the road and found our halftrack still where we had left it, but alongside it was a truck and about 15 "gooks" working on it. We were fully loaded and before we left the truck had been knocked off the cliff, the halftrack was left burning and we dropped our daisy cutter bombs in the bushes where we saw Commie soldiers hide.

J. J. in a Jam

One of the most harrowing experiences which any of our 311 pilots went through occurred on an early morning "recky." J. J. O'Reilly, in a four-plane flight, was about to follow his flight leader down on a target when a shell burst just outside his cockpit. The concussion knocked him out and when he came to he was at about 3,000 feet, inverted. He rolled right side up but couldn't find any of his wingmen.

The concussion and fragments from the burst wounded J. J. in the legs, shattered most of his instruments and damaged his canopy to such an extent that he had to jettison it in order that the breaking glass not continue to cut him.

Due to his complete lack of navigational instruments and his state of shock he remembers nothing until he was about over the Yalu or somewhere close by. At this time he had climbed to 20 thousand and on recognizing landmarks he headed for home. His fuel was low and rather than risk running out he chose to combat the numbness that threatened him from the low temperature at such altitude

Unknown to us back at K-3, J. J. was up against the greatest odds of his career. The cold, the wounds which were making his legs stiffer by the minute, plus the shock of the whole incident, were worry enough without having to bring home a crippled jet fighter and set it down successfully on a 5,800-foot rolling fighter strip.

About 50 miles out O'Reilly's radio call came through to the tower, incoherent and weak, but distinguishable enough to let us know that he was on his way back in. The crash crew was alerted, the traffic in the pattern warned of his approach and we all gathered at a vantage point where we could "sweat out" J. J.'s approach. The ambulance with the doctor was with the crash crew to assist the pilot as soon as he could be reached.

J. J.'s approach and subsequent touchdown and rollout were normal and routine as any of a dozen landings he had made prior to this all-important one. When the *Panther* rolled past the crash crew and ambulance they raced after it down the runway thinking he would stop at the earliest opportunity.

His state of shock (the doctor later told us) had reached such a point that he was just about out on his feet. He ignored the vehicles and arm-waving of would-be helpers and followed the taxiway to the parking area where we normally left our aircraft after each mission. There he stopped, and one of the pilots standing nearby jumped onto his step and shut off his engine since once at a stop he seemed unable to cut his switches.

By this time the doc had arrived. After making a preliminary examination of J. J.'s wounds he gave the order to remove him from the cockpit and take him to sick bay.

J. J., one of the most well-liked boys in 311, had felt cheated that in World War II he was not ordered to combat but had to instruct others in the States; he wasn't about to let another chance slip by to rob him of actually fighting the enemy this time.

Thanks to our good Doc Driscoll from Boston, J. J. was soon back flying with

PILOT AID

By BOB BLATT

MODEL PLANE WALL CASE

This attractive wall case displaying model planes and helicopters has really paid off for this aircraft service operator. According to Tom Hintze (left), Director of Westair Flying Service, Inc., Westchester County Airport, White Plains, N. Y., it pays the phone bill and some of the other bills around the place. On the average, Hintze says that about 175 sales per month result from this display, which is located prominently in the sales room, just outside the pilot's lounge.

The wall case is a regular department store type—6 feet wide, 8 feet tall and 18 inches deep. The sliding glass doors make it easy to reach all the merchandise without the inconvenience of most standard type showcases. On rainy days or when flying weather is bad, this display helps to sustain interest among the pilots who are hanging around waiting for better weather. The "best seller" item in the case is a plastic model of the Hiller *Hornet*, a jet helicopter. In the picture with Tom Hintze are Dr. and Mrs. E. Rodin, plane owners.

us, none the worse for his experience and as happy and eager as he had always been—an example for the greener men to follow and look up to.

Panther Praised

The months spent in combat in the F9F made us thankful many times over for the strength and ruggedness that the Grumman manufacturers built into the *Panther*. We were forever having its toughness and reliability demonstrated to us.

I pulled out of a strafing run one mid-afternoon and with my bomb load still on hit an air pocket which slapped my head with the hard hat up against the canopy and registered a minus 2Gs on my accelerator. Nary a wrinkle or after-effect from such rough abuse was evident when I returned.

One of my wingmen one day had a rocket blow up while still in its wing rack and the first anyone knew of it was when he called and said, "Guess I'd better go home cause I'm using up too much fuel with this hole in my wing." The F9F isn't the fastest jet in the world today, but that built-in, "come home regardless" feature it had made up oftentimes for the lack of speed which many of the other jet jobs had.

The pilots of VMF-311 after being in and out of combat for nine months were gradually relieved of their squadron duties and placed in staff jobs to more fully utilize their experience. Fresh pilots were arriving from the States to take up the fight where we left off.

After about six weeks to two months in staff positions the original pilots of VMF-311 began receiving their orders overseas again—only this time the direction was east to those homes and families which we felt we were in Korea to protect.

Anyone who has never left these States of ours cannot begin to imagine the thoughts, thrills, and downright thankful feeling you get when the knowledge finally comes to a fellow that his family and home are but hours away. Say what you may about other joys, but orders to Stateside are like orders to Heaven.

Probably all of us recalled Reserves in 311 shared the common feeling that to us with families and responsibilities at home the need was as great in 1950 as it was in 1942, perhaps even greater for the danger isn't as apparent as Pearl Harbor was. Thank God for our training in the Reserve program. Never was the Chinese proverb "The more you sweat in peace the less you bleed in war" more fitting than when applied to the officers and men of the Marine Air Reserves. END

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Shrimplift

(Continued from page 17)

shrimp, freezing plants and all processing facilities were centered mainly in these two shrimping centers, with some other plants scattered along in the general vicinity of these two ports.

For several years shrimp production has been good in this part of Mexico, but quite suddenly last spring there were not enough shrimp in the waters adjacent to the main shrimping ports to justify the cost of catching them. A boat and crew would go out, remain at sea a week, and come back with perhaps a thousand pounds. In spite of high prices for shrimp this meager catch did not pay.

Then, quite as suddenly as shrimp had disappeared from around Mazatlan and Guaymas, they showed up in tremendous quantity around Salina Cruz, the southernmost port on the west coast of Mexico.

Salina Cruz had a harbor but little else to serve the 500 shrimp boats that converged upon it. Ice facilities were sufficient only for the normal use of the community, whereas the average shrimp boat even on a comparatively short run needs at least 10 blocks of ice, or a total of 3,000 pounds. On longer runs, about 100 blocks go into the hold of the larger trawlers, crushed and blown in ready for preserving the shrimp catch.

At Salina Cruz there were no facilities for washing, grading, processing or freezing shrimp; and shrimp is a highly perishable commodity, requiring immediate refrigeration. Yet the shrimp boats, their crews eager for good catches once again, converged upon Salina Cruz.

Airline to Rescue

Jorge Olivieri, owner of Congeladora de Mazatlan, S. A., at Mazatlan, 1,400 miles north of Salina Cruz, in considerable desperation, sought out officials of Cia. Mexicana de Aviacion, S. A., told them of his plight and the plight of many other shrimp producer-dealers whose boats were fishing out of Salina Cruz, and asked if aviation could come to the rescue of the shrimp men.

The aviation men thought they could help, and so a "test" run was formulated. It was in two phases. Ice was as badly needed for preservation of shrimp aboard the boats while they fished as facilities for processing and freezing were needed after the shrimp was landed. So the first phase of the operation involved flying ice from Vera Cruz, on the Gulf of Mexico, across Mexico's "hump" and down the other side to Salina Cruz.

The second phase involved loading shrimp, sacked aboard the shrimp trawler, into the C-54 for the 1,400-mile trip to Mazatlan. Because of the altitude at which the plane flew, the ice which was left among the shrimp aboard the boats was in ample supply to continue preservation on the flight.

At Mazatlan, trucks met the plane and the sacked shrimp was rushed to the processing plants, for washing, grading and packing, thence to the freezer for quick-freezing. Elapsed time between removing the shrimp from the holds of the trawlers until it was safely in the processing plant at Mazatlan, was six and one-half hours.

This test run was so satisfactory that not only this company utilized the services of aviation many times afterward but so did most of the other dealers in Mazatlan and Guaymas, 1,700 miles north of Salina Cruz.

Next to quick-freezing, aviation has done more than any other one factor in expanding the shrimp industry from a minor role in the overall seafood industry only a few years ago to the most spectacular of all commercial fisheries today. This is true because freshness is all-important in maintaining shrimp at a taste-appealing stage. Quick-freezing and aviation have combined to make maintenance of freshness and quality a comparatively simple matter.

Texas Leads

Today, the United States produces about 150,000,000 pounds of shrimp and about 50,000,000 pounds are imported from Mexico. Texas alone produces one-third of the United States production; and because Texas is far-removed from the larger shrimp markets, speed in handling the catch from boat to market is imperative. Aviation has helped greatly in making this possible.

Shrimp cargo is lashed down for flight.

In Carmen, several shrimp producers have their own cargo planes for use in transporting their catches to the United States. Among them is Abraham Friedman, owner of Productos Marinos del Sureste, S. A. He has his own processing and freezing plant but finds it practical to fly his frozen shrimp to markets in the United States rather than wait on slower means of transportation.

He says that being able to deliver a plane-load of shrimp to a customer in the United States the same day he receives the order is alone worth the cost of maintaining his own air delivery, particularly in view of the fact that shrimp is a fast-moving commodity with quick-changing prices.

Aviation is used liberally by the shrimp industry in opening both new production centers and new markets. As in the case of Salina Cruz, shrimp "runs" do not await the building of shore facilities for handling shrimp; and so whenever a new shrimp run is discovered, air transport meets the need until facilities are available for more leisurely processing.

In Panama about three years ago shrimp showed up in profitable quantity and of tremendous size. The large size meant a premium price if the shrimp could be delivered in the United States; and aviation was called on to deliver. It did. Now a refrigerated cargo vessel makes regular runs between Panama and New York and hauls most of the shrimp, but the airplane is still called upon frequently for a fast delivery of premium-price shrimp from Panama to American markets.

Experience Necessary

Soon after the end of World War II, there was a "rash" of small shrimp operators who bought government planes, converted them into cargo jobs and started buying shrimp along the Gulf Coast, hauling it to inland markets and selling at a premium. Most of these failed, not because the idea was impractical but for lack of experience in the shrimp business. They had no dependable, constant source of supply. Only the dealers who have their own fleets can deliver shrimp when promised, and even they are at the mercy of the weather and the vagaries of the shrimp "runs."

One of the successful operators of this type is Tom Edwards, owner of Airborne Wholesalers Co., Corpus Christi, Texas. He says that he could not possibly have succeeded with the idea if he had not arranged for a fairly consistent supply of shrimp; and even under these conditions finds it necessary to curtail his airplane delivery at times because of lack of sufficient supply.

The price of shrimp not only justifies the use of aviation in its handling but makes it imperative that the speed of air delivery be used at times in order to prevent loss or deterioration of the catch.

The price depends on the size of shrimp. The basis of pricing is the 15-20 count, which means that 15 to 20 shrimp, heads off (heads constitute 40 per cent of the shrimp) make a pound. The dealer or producer of shrimp gets from 55 cents to 75 cents per pound for 15-20 count shrimp, frozen and packed in five-pound cartons. Smaller shrimp, divided into four other grades, sells normally at five cents per pound lower than the count above it. In Mazatlan, Refrigeradora del Noroeste, headed by Pedro Pinson, produces enough extremely large shrimp to justify packing a 6-10 carton and a 10-15 pack. The larger of these two packs brings about $1.25 on the Chicago market. Obviously such a cargo can be shipped profitably by air in order to preserve its freshness and high quality.

The shrimp industry is lusty, a little boisterous and is growing rapidly. Those who produce shrimp are adventurers who are willing to go anywhere the shrimp run. There is talk now of a possible large shrimp bed off Brazil. If there is, you can depend on American shrimpers to develop it—and they will be calling on aviation to deliver their catches to American markets. END

She Couldn't Say No

(Continued from page 31)

thing ahead was loaded for bear. However, as we stood on the ground and watched, the black mass slowly began to climb the Sierra, and the valley behind was clear though dark. I had an unhappy feeling at the thought of approaching, but I felt that Dan was somewhat woebegone. When he asked if we could get through to Bishop, I hadn't the guts to say "not now." We had only half an hour of daylight left, and I hated to strand the poor guy in a wide spot in the desert.

With what I hoped was due caution, I flew across Owen's Lake, over Lone Pine. I saw Manzanar airfield ahead, and high and to the left the black bogie was hung up on the side of Mount Whitney. Then, without warning, an invisible demon struck us. It lambasted us so hard that our jaws snapped. The airplane was like a scrap of paper in a whirlwind. We were sucked in and spewed out and buffeted around, while I got us slowed down enough so I hoped the wings wouldn't come off.

Dan said later that the rate of climb read first 2,000 feet a minute up, then 2,000 down, over and over. To say we were terrified is an understatement—snarly peaks glaring in the windows, and a whirlwind tearing around with us caught in its hair like a burr. I fought to stay approximately right side up—with what small success was shown when we staggered into Manzanar some minutes later.

We got into that because I hated to delay my passenger. I thought "Good Lord, You let us down out of that one, I promise I won't ever do it again"—but I did, last summer.

After a weekend near Wilmington, N. C., I invited my partner, Jim Webb, to fly home with me. He had never been up before and I gave him a great sales talk about the advantages of air travel—no traffic, no dust, an hour and a half instead of five hours, etc.

The day was hot, the runway sandpitted, but I walked over the strip and planned and execu.ed a beautiful takeoff. With two of us aboard and all that heat, I had the wheels off the ground in a hundred yards. "Pretty sharp," I thought.

We had to take on gas, so I flew to Wilmington, 25 miles north. The homeward path from Wilmington would follow a road and a railway—safe things to stay close to. By the time we reached the city, we saw a weather change; the blue sky was cut half across by black clouds. Evidently the cool, moist air from the sea was boiling over the hot land, and raising a wall of towering cumulus all the way from Norfolk to Charleston. This sort of bad weather—a kind of coastal front—was something I'd never encountered in California. When a lightplane pilot changes terrain, he's a beginner all over again.

The big cumulus north of us was moving in, but I figured it was plenty far away and I could beat it. Here again, I underestimated the extent of turbulence surrounding a storm—it can extend for miles. And again, there may not be any. There may be seers who can tell the nice storms from the bad actors, but I'm not one of them. This one didn't look good, and if I'd been alone I think I'd have sweated it out; but I couldn't bear to let Jim down.

So, motivated by a desire to impress Jim, I practically impressed the whole runway on him a few minutes later. Were it not for that wonderful Cessna gear, we'd have turned a cartwheel in front of the tower.

As far as superficial indications went, there was good reason to take off. Two *Cubs* were shooting landings, the sock hung limp, the tower gave us a green light. (Static had knocked the radio out.) All I can say is—if you're within five miles of a big storm, be prepared. Prepared I was not, and what hit us I'll never know—probably one of those great eddies of air that can curl so far out from the margin of a thunder cloud.

Take-off, Sidesaddle

No sooner had I raised the tail than hell broke loose, and we started tearing off sideways. Things happened so fast the controls acted too slow to compensate; we were all over the place. All the forward stick I could give wouldn't hold the ship on the ground, and with no flying speed we were first 20 feet aloft, then sucked down. The plane was like lead. We took a nasty side-swipe off the pavement, bounded into the air sideways like a scalded jack rabbit, and staggered drunkenly off. Suddenly the air became smooth and tranquil again. I put my stomach back in place, and turning west, approached the line of clouds to probe for an opening—silly girl.

We flew westward along a railway line for 10 miles, then were turned back by a black squall with heavy rain. Looking north again, I saw a break—light rain maybe, but decent ceiling and visibility, and worth a try if we were ready to turn and run at the first sign of danger. Now here was where I made my second miscalculation, for I was so busy studying the weather that I forgot to consider the terrain underneath. I turned in under the ragged curtains of cloud, and 15 minutes later we were threading down dark corridors of cumulus 1,200 feet above the swamps of the Cape Fear River. We had no landmarks, no radio, just the compass.

We got good breaks—slight turbulence, no hail, my navigation clicked and we intercepted the highway exactly where I expected.

It was not until the next day that I did a horrified double-take. What a foolish thing to do—scramble around at low altitude over country where a forced landing would be extremely perilous. One burst of hail, one low and engulfing cloud and our number would have been up. . . .

AND I HADN'T FILED A FLIGHT PLAN!

I do believe these hair-raisers taught me a lesson. Later on last summer, I flew a doctor from North Carolina to New York and back. But not all the way back. This time I said—"NO!" We reached Richmond at nightfall, and the weather looked perfect to the Doc. It looked perfect to me, too, except for two little things—lofty cumulus far away on the horizon, ahead and to the left, and a weather report which, interpreted with imagination, MIGHT mean trouble across our intended path. The Doc protested, but I said I was the skipper. Smarting with ignominy, I put him on a bus, and took myself to a hotel. Next day I found that violent thunder showers had struck Chapel Hill at dusk, and continued all evening. Saying "no" had payed off. END

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Weather Map

(Continued from page 35)

flows overhead, you have less pressure upon you and you are said to be in a "low" or area of lower pressure. The barometer is as much a scales as your bathroom weighing machine; it weighs the weight of the air above you, and for a balance weight it uses mercury. The more mercury, the more air it is balancing. Drawing Two shows this graphically. Look back now at your newspaper weather map and try to visualize the hills, valleys and plains of air-density there.

Before we go further, I want to mention that the daily newspaper-type weather map is not at all a prediction of tomorrow's weather. Today's map is really a picture of yesterday's weather, for by the time you receive it, the picture had to be compiled, analyzed, drawn, the plate made and printed and the newspaper distributed. The weather as you read the map might be quite changed from the plan you are looking at. It is like looking at yesterday's stock quotations to determine what will happen today or tomorrow.

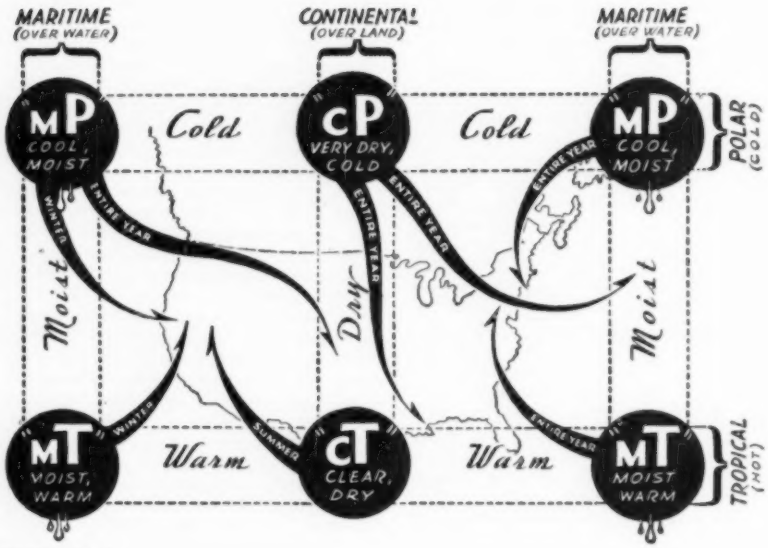
To be able to use this "historical record," you must at least know the habits and tendencies of different weather patterns—which way they flow, how strong or persistent they are, and when it is time for a new pattern to build up. I cannot think of any better way than to keep a series of maps and thereby see their actual movements and trends. Do this for a month, keep notes on it, and you are immediately a weatherwise person. Some time, I hope, each daily weather map will be supplemented with a map for the day before on the left, and a predictive map of tomorrow's pattern on the right. What a fine test for the mapmakers this would be! More important, it would explain something to the reader.

Drawing One shows an average weather map pattern in the middle with dotted lines going from each feature to a thumbnail explanation of that symbol. Something very important which most maps as yet leave out, is the airmass. Most maps are a tangle of "fronts." Granted, the front of an airmass is where the collision and most of the weather fuss is kicked up, but the great mass itself will tell you what the days of weather behind the front will be like. A cold front, for example, may be a very narrow strip of storm, while the weather behind it might last for quite a while and will be of the greatest importance.

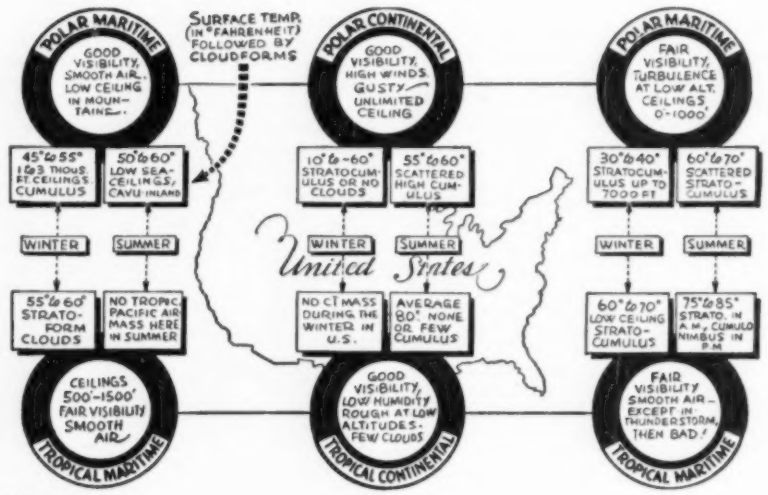
The airmass is simply a gigantic hunk of atmosphere that goes traveling, bringing you new weather. The cold or warm front is the front of such an advancing mass of cooler or warmer atmosphere.

Drawing Three shows a cold and a warm airmass first building up, then moving toward the right. The frontal symbol of each can be seen marking the collision-front of the mass where it contacts the ground.

Drawings Four and Five are simplified charts of the major North American air-



DRAWING 4


POLAR MARITIME
GOOD VISIBILITY, SMOOTH AIR, LOW CEILING IN MOUNTAINS.
SURFACE TEMP. (IN °FAHRENHEIT) FOLLOWED BY CLOUDFORMS
POLAR CONTINENTAL
GOOD VISIBILITY, HIGH WINDS, GUSTY—UNLIMITED CEILING
POLAR MARITIME
FAIR VISIBILITY, TURBULENCE AT LOW ALT. CEILINGS 0-1000'
45° to 55° 1 & 3 THOUS. FT. CEILINGS CUMULUS
50° to 60° LOW SEA-CEILINGS, CAVU INLAND
10° to -60° STRATOCUMULUS OR NO CLOUDS
55° to 60° SCATTERED HIGH CUMULUS
30° to 40° STRATOCUMULUS UP TO 7000 FT
60° to 70° SCATTERED STRATOCUMULUS
WINTER
SUMMER
WINTER
SUMMER
WINTER
SUMMER
United States
55° to 60° STRATOFORM CLOUDS
NO TROPIC PACIFIC AIR MASS HERE IN SUMMER
NO cT MASS DURING THE WINTER IN U.S.
AVERAGE 80°, NONE OR FEW CUMULUS
60° to 70° LOW CEILING STRATOCUMULUS
75° to 85° STRATO. IN A.M., CUMULONIMBUS IN P.M.
CEILINGS 500'-1500' FAIR VISIBILITY SMOOTH AIR
TROPICAL MARITIME
GOOD VISIBILITY, LOW HUMIDITY ROUGH AT LOW ALTITUDES-FEW CLOUDS
TROPICAL CONTINENTAL
FAIR VISIBILITY SMOOTH AIR—EXCEPT IN THUNDERSTORM, THEN BAD!
TROPICAL MARITIME

DRAWING 5

masses. It couldn't be more logical; the sea masses are marked M for maritime, the land masses are marked C for continental. The northern masses are marked P for Polar while the southern masses are marked T for Tropical. Land air is dry, sea air is wet; north air is cold and southern air is warm. So mP, cP and so on are simple symbols describing where the air came from and what it is like.

Chart Five should not be learned until Chart Four has been digested. It shows the weather effects and visual qualities of each airmass. Between the two charts you can see their usual routes and what the weather might be behind the major North American airmasses. By watching for a strong front on your weather map, you may decide if it is the front of one of these airmasses (unless the map has already indicated such—newspaper maps don't), and then you may look for the temperatures and cloud effects indicated on Chart Five.

Many persons are confused about the numbers at the ends of the isobars which sometimes measure the "hills" and "valleys" of air by inches of mercury and sometimes by numbers indicating something called millibars. Don't be confused because whether the isobars were measured by quarts of ale or pounds of potatoes, the result would be the same. As long as one isobar is higher than the other, you get the contour effect.

Even with your barometer, whether it is a mercury or an aneroid type, the actual measurement on it is not as important as the fact that it has been steady, rising or falling. Weather, like weather maps, is a flowing, turning, twisting thing; our maps and instruments are only machines to help us predict the trends and possibilities of the next few hours or the next few days. END

Hot Rod for Jets

(Continued from page 16)

neers know from first-hand encounters.

First poser is igniting the afterburner flames. Contrary to expectation, it was found that fuel injected into the hot afterburner did not ignite spontaneously because of the tremendous velocity of the gases. Igniter plugs have to be provided to spark the combustion.

Keeping the flames going and confined within the afterburner is another stickler. For instance, in the British Nene turbojet the velocity of the jet stream is 820 feet-per-second or 932 miles-an-hour. The flame propagation rate of the fuel burned in the afterburner is only 490 feet-per-second or 556 miles-an-hour. Igniting the combustion is like trying to build a bonfire in a hurricane. The jet stream tends to blow the flames right out of the tailpipe. This obstacle must be overcome, not only to start combustion but also to develop thrust because gases burned beyond the exit nozzle produce no useful thrust.

Critical Temperatures

Controlling temperature is another engineering enigma. Most afterburners will burn substantially more fuel than the jet engines they serve. The Nene afterburner consumes 1,110 gallons-per-hour compared with the Nene's consumption of 790 gallons-per-hour at full throttle. Together, they gulp down a whopping 1,900 gallons-per-hour or 32 gallons every minute. With such prodigious combustion, temperatures soar and it is desirable that they do because that accelerates gas velocities which, in turn, produces increased thrust. But, with flame temperatures running to 2,650° F. and melting points of afterburner metals pegged by nature at 2,723° F., it takes careful design to prevent the afterburner from becoming a blast furnace which smelts itself into a fused mass of metal.

Hand-in-hand with the design problems which confront the engineers are the metallurgical hurdles. Afterburners make generous use of cobalt and nickel-base alloys which are rich in these scarce metals. Because some of these alloys are new to production, Ryan metallurgists closely supervise their fabrication. They must be formed quite slowly because they tend to work-harden under rapid forming rates. They have to be annealed at higher temperatures than stainless steels and require special welding and forming techniques. The properties which make them ruggedly resistant at high temperatures also make them more difficult to fabricate.

The basic elements of afterburner designs are the fuel injector, flameholder and adjustable nozzle. Fuel is injected into the swift jet stream through the injector which sprays it under pressure. In the General Electric afterburner, this device consists of a circular stainless steel tube bristling with precision-drilled rods. The fuel flows through these tubes and is sprayed into the jet stream through tiny orifices, aft of the jet engine turbine wheel. For ignition, most designs utilize a specially made spark plug system. To create regions of low-velocity gas and turbulence, so that combustion can be maintained, a flameholder is installed in the duct. In some designs, the afterburner pipe is diverging in cross-section at this point so that the gases can expand, thereby losing speed.

Every attempt is made to confine the raging combustion to a specific area, to prevent metal attrition, and to stabilize the burning. After passing the flameholder, the volcanic gases are encouraged to attain maximum velocity because the speed at which they leave the exit nozzle determines the thrust which they impart to the plane.

The mass and velocity of the jet stream are so radically altered by the operation of the afterburner that a means of varying the exit opening area must be devised to maintain a balanced mass flow through the system. The desired objective, with or without afterburning, is to attain maximum thrust commensurate with temperature and pressure limitations. If the jet blast is unduly restricted at the exit opening, excessive back pressures will occur and internal temperatures will rise. If the exit opening is slightly too large, the jet stream velocity will decrease and thrust will drop. These factors are sensitively interdependent and affect each other in an immediate way.

In the General Electric afterburner, the exit opening is varied by means of an "eyelid" arrangement which is closed during normal engine operation and opened to handle the increased volumes of gases during afterburning.

Most afterburners are fitted with automatic controls which are actuated by pressing a button. This advantage became apparent after a number of starting failures resulted in "hot starts." Caused by the accumulation of fuel, when positive ignition did not occur, these "hot starts" are tantamount to an unwelcome explosion of disturbing proportions—rather like letting the gas fumes collect in the gas range before lighting the oven.

With automatic starting, the complete cycle of ignition is accomplished in less than one second without pilot supervision. Eyelid movement is also automatically provided so that these restrictors open when combustion takes place.

An interesting idea, which has been subjected to preliminary tests, is that of introducing the fuel for afterburning ahead of the turbojet turbine wheel instead of aft of it. In this way, the turbine wheel could act as a flameholder and the turbine nozzles would function as atomizers, breaking up the fuel. Because of the natural delay in ignition of 1/1000 to 2/1000 of a second, combustion, with its attendant temperature rise, would not take place until the mixture was several inches past the turbine wheel assembly. This would prevent increased turbine wheel temperature.

If successfully developed, this idea could eliminate one of the main disadvantages of an afterburner by removing the resistance to the jet stream flow which the injector and flameholders present. Also, such a development would permit a much shorter tailpipe, or re-heat pipe, which would be well adapted to high speed aircraft with swept-back wings. END

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High Safari

(Continued from page 13)

were twice lost over Congo jungle and once over the swamps of the Nigerian Delta . . . and then bust out crying when after three hours of red tape in Lisbon they shoved another government form in front of her. At our ages . . . Winnie is 38 and I'm 49 . . . the onslaught of man-made obstacles seems more frustrating than the problems posed by wind and weather.

I don't mean to imply that I'm blase about weather . . . I've only had a license since 1948 . . . but I do mean that ICAO or FIA—whoever is supposed to be working at the job of international air tourism—could find a lot of ways to make it easier for us little people.

We are often asked if it doesn't worry us to fly over some of the country we have covered. But what's the difference what kind of country it is if you do fly over it? It's only when you don't fly over it that bad country is bad for the flyer.

Originally leaving Wonderboom Airport in Pretoria, Transvaal, we cleared Customs at Pietersburg and flew north to Livingstone on the Zambezi in Rhodesia. The Victoria Falls is one of the wonder sights of the world. Twice as high as Niagara, the mist from the Falls rises 1,000 feet and can be seen over 50 miles. A British *Comet* was in Livingstone when we landed. We had much in common—we were both going to London.

Lunar Rainbow

The first day out we usually take it easy so we stopped in Livingstone and went out to the boat club on the banks of the beautiful Zambesi to watch the fishermen come in with their catches in the evening. Each must report in case he has had trouble with crocodiles or hippos. Under a full moon, we went also to see the Lunar Rainbow on the Falls mist, a gorgeous sight.

Next morning, at daylight, we took off and flew via Lusaka to Elizabethville, just over the border of the Belgian Congo. We had put an extra 19-gallon tank in the back seat to give us seven and a half hours fuel. From there we went on northwestward to Luluabourg. We tried a short-cut, got over some very rough country and heavy jungle with not even a native hut to be seen, so headed for the railroad. Railroads in Africa are narrow gauge with very little cleared right-of-way and have a bad habit of disappearing around a corner under a bush.

We have never had a forced landing, but have been briefed plenty, especially by the timber cruisers in the Canadian Rockies, on how to sit a plane down in the bush. In tropical jungles it is best to sit down near a river or trail if one can be found. If necessary to land in swamp it is best to try a belly landing near the edge.

We had radio. This was mostly to meet regulations. Under ideal conditions we could get five miles on it. During the entire trip we established radio communication only three times. Our call sign was "Zulu Sierra Delta Echo Nectar" but we never heard of anyone using this new "fantastic" alphabet.

Next morning we took off from Luluabourg, got out 100 miles over heavy jungle and ran into weather we could neither get under nor over so reversed our course and hit Luluabourg right on the bean—no beam. Then we waited three hours and, as there were storms on the Kasai River, we tried a westward cut-across of 570 miles to Leopoldville on the Congo. There was one aerodrome in between which we were told we would probably miss—and did. After dodging a number of storms we finally hit the tremendous Congo River, and located Leopoldville.

Leaving Leopoldville early next morning we cruised 200 miles up French equatorial Africa along a shallow valley at 200 feet to stay below cloud—then for another 300 along a valley surprisingly good compared with the stuff we had been over. But when we got near the Ngunie and Ogowe Rivers we were above some real thick jungle. It must have been 200 feet high. Fortunately we had only about an hour's flying over that before reaching Libreville on the south Atlantic coast.

Crack Shots

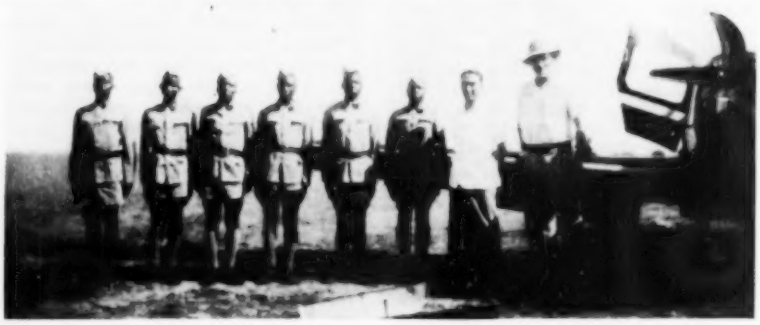
We had studied jungle and desert survival methods and were well prepared with emergency equipment. In case of a landing in the jungle, build a fire at night on each side of camp for protection against wild animals—or climb a tree. We carried a week's supply of water and food. For weapons we carried pistols. They are not much use if you need a cannon or don't know how to use them, but my wife with her Colt Woodsman can trim a lion's eyelash at 20 yards, and if I opened up with my "45" I could kick dust in his other eye. We figured to have him at a disadvantage. For replenishing food supplies, watch what the monkeys eat. We also carried razor-sharp hunting knives, axe and machete.

At Libreville the weather man said it was good flying but a bush flyer, who had trained with the Free French in the States, looked outside at the squall and said "Take it easy, boy, take it easy." That proved to be very, very good advice. For the first hundred miles north out of Libreville we ran into some sticky stuff and detoured three times before finding an opening through it. In the tropics if there is a 600-foot ceiling in rain, that is "good flying conditions." If it goes below 400 feet they say, "use your own judgment." In Paris, when we wanted to take off for Copenhagen, we were held up from early morning till 3 p.m. because of a 600-foot ceiling at Brussels.

After getting through squalls north of Libreville we had clear weather and saw Mt. Cameroon in all its magnificence rising sheer 14,000 feet above the sea. Then on across the Nigerian Delta, looking for Calabar Aerodrome. Visibility had deteriorated and just try to map-read a river delta! Even Winifred, who has had 700 hours map reading experience, could not figure this one out, so we wandered back and forth across the swamps until we finally located the airport.

When we landed, 500 natives came out of the bush, curious about the first lightplane they had ever seen. After a song and dance at some distance, they edged

Dr. Haldeman is met at the airport in Anglo-Egyptian Sudan.



A Portuguese officer and native soldiers in Portuguese East Africa.

closer and dashed around the plane. When one of them touched the wing tip a native guard threw his spear at him, missed the busher, but put a hole right through the wing. There was dead silence . . . thank God no dead native . . . and the guard went sickly grey as he looked at the spear hole. He was scared stiff and most apologetic. He said, "Boss, me fix"—but I doubted C.A.A. would pass his repair job. The hole did not affect flying characteristics so we waited until London to get it repaired. The natives disappeared back into the bush. The guard paraded around the plane all night swinging a big machete, but we slept by it to make sure there would be no more holes.

Insects an Item

In fact, we often slept at airports beside the plane or in the airport lounge. This saved time and taxi fares. Besides it is interesting to hear the native drums on an occasional lion roar. We were bitten and chewed by mosquitoes, flies, spiders and lice. We were always scratching. Arab lice take the best bite but the mosquitoes are babies to those in Western Canada. Plane and bedding were sprayed on arrival and departure at each tropical aerodrome. We carried no quinine or other medicine.

We went on, delayed at Abidjan above the Gold Coast by weather and always facing prevailing head winds. Similarly when we returned down the East Coast of Africa prevailing winds were again against us. At Freetown a big snake was killed at our rest hut as we were moving in. From there across the desert to night-stop at Port Etienne, where the Arabs refuelled our plane. Native plane service has to be supervised very carefully, especially among the primitives. At one place they filled the crank case full of oil; at another they were putting the nozzle of a big oil hose in the gas tank to "fill 'er up" when I stopped them.

At Port Etienne we ate in a real desert dive, with two smoky lanterns lighting the joint. A bar at one end was crowded with picturesque Arabs and people of all colors and nationalities.

Next day we cruised more bleak desert up the West African coast. As one flyer said, "There is nothing on the map and there is nothing on the ground." We night-stopped in Agadir, French Morocco. My wife was thrilled listening to a Foreign Legionnaire telling his experiences.

Continuing north, we buzzed the old forts along the Barbary Coast; stopped at Lisbon and Madrid to gawk like any tourists. Spain is now the favorite tourist country in Europe—good food and entertainment at the most reasonable prices. Leaving Madrid we ran into low cloud and rain over rough country and squeezed down valleys until we were lost. We could not go north to get around the end of the Pyrenees but finally came up against them, saw an opening and climbed over the top, saw a hole on the other side and went down through to find good ceiling and level country on the French side. We arrived in Paris an hour and a half late on our E.T.A. Paris tower was not expecting us although we were on a flight plan. This was common on our trip. Many places did not expect us when we arrived.

Minor Mechanical Matter

In London I checked the plane and had the main spring of the clock fixed (the only mechanical trouble on the entire trip). We flew up to Scone Aerodrome in Scotland and ran into a new experience—the black mist off the North Sea. Weird stuff. Fortunately for us we had flown over 25,000 air miles around North America the year before we left, so had seen all kinds of weather. In South Africa we had had only one and a half hours' weather delay in 18 months of flying.

We stopped over to visit in Paris and Copenhagen, and at Oslo lived in a luxury hotel during the Chiropractic Convention.

Leaving Oslo for our return trip, low cloud pushed us away from the Coast and we got lost for an hour over Norway and Sweden. Out of Holland we flew down the Rhone Valley, past the Alps, and along the French Riviera having circled the Leaning Tower of Pisa and paused in Florence to visit this wonderful old city. Then on to Rome, down Italy and across Sicily.

Taking off from Palermo the sun and downdrafts caused the motor to heat up more than in climbing over the mountains. In the excitement of our first big water crossing, the Mediterranean, we took the wrong compass course, hit an island, discovered the error and, corrected course for Tunisia. In crossing the English Channel we had found that my life belt had a hole so we blew up our air mattresses for the Mediterranean crossing.

After formalities we took off from Tripoli an hour after sunrise. The heat was oppressive and the overloaded Bellanca took an hour to get up to 5,000 feet.

At Tobruk we stopped at the R.A.F. aerodrome and could see the marks of battle still on the desert. It is estimated that eight million land mines were planted by the Italians, Germans and British, and that there are still over four million left, no one knowing where. During the evening we heard several of them going off and were told this was the usual thing due to deterioration and other causes. The Arabs have learned to walk around the mine fields with comparative safety now, but at one time it was not uncommon to see one walking across the desert when suddenly there would be a loud bang and then—no Arab.

Nile for Navigation

We flew on to circle the Sphinx and Pyramids, landing at Farouk aerodrome. Following the Nile Valley, we crossed about 200 miles of lava rock that looks like the beginning of the world, more drifting sand, finally arriving at Kisumu on the shores of lovely Lake Victoria. Up across the deep Rift Valley, we flew over the high mountains to Nairobi and down the coast to Mombasa, where for 3,000 miles there are wide, sandy beaches along the East African coast.

We were all prepared for a nice, easy flight home on schedule when we landed at Porto Amelia, Portuguese East Africa, where a lion had been shot on the runway a few days before. We expected to get fuel but waited five days for 10 gallons to be brought in over the jungle roads. Supplies supposed to be there had been taken out three months before because there was no demand.

After we got the fuel we hopped 150 miles into Mozambique for a fill up; then night-stopped at Inhambane, a sportsman's paradise. Off at daylight, as there is a minimum of red tape in Portuguese East Africa, into Lourenço Marques, an interesting city with its bull fight arena and world famous museum. Two hours after leaving there the mine dumps of Johannesburg came in sight. We landed for Customs clearance and checked the plane with extra care to be sure that "Winnie" was all right for the last 20 minutes flying of a 22,000-mile trouble-free trip around two continents. As "Winnie" gently landed with us on Wonderboom Aerodrome, we heaved a sigh of relief. What a vacation! What pictures to hang on the walls of memory! Yet how good to be again in peaceful South Africa and to find the children well and happy to see us.

Everywhere people had been friendly and helpful. During six weeks we had been so many places, seen so many famous sights, eaten the food of so many lands, done so much living in such a short time, that it still seems like a dream. What modest investment in all this world could return such dividends as our little plane! END

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The Genius of Giuseppe

(Continued from page 37)

to drive an automobile.

Bellanca continued his flying school until the United States entered the First World War. In the meantime, he designed and built a tri-motored plane and submitted the design to the British government. The design was accepted, and the British placed an order with him for 40 planes, with the proviso that they be powered with Gnome rotary engines. Here fate stepped in. Bellanca could not raise money to buy the engines and lost the contract.

Shortly after the United States entered World War I, he projected a four-engine craft for a large European power. For more than nine months he worked on the plans. The engines were arranged in double tandem and fitted with controllable pitch propellers. This plane had a top speed of 160 mph—very fast for that time. Bellanca interested a financier in building the craft, but just before the deal was closed the man was killed in an automobile accident. Once again, Bellanca took it on the chin.

Next he joined the Maryland Pressed Steel Co. and designed several highly efficient types for that firm. Then it went into bankruptcy.

First Cabin Plane

Following Horace Greeley's advice, Giuseppe turned west, finally stopping at Omaha, Nebr. It was there that he picked up an engine from a junk dealer for $35 and around it built one of the first American cabin planes. This ship, built in a makeshift factory, was similar to his later famous monoplanes. This first Bellanca cabin plane was modestly successful—to the extent that it won 13 first prizes in national and international air meets.

After the completion of this cabin job, Bellanca set to work developing wings for the deHavilland planes of the Air Mail Service. These D. 11's were war-production craft and inefficient even though powered with the 400 hp Liberty engine. The Air Mail Service decided it must either improve the performance of these ships by fitting them with new wings or discard them entirely. Perfecting his wing design, the little engineer went to New York, secured a contract to build the wings, and set up shop in an abandoned hangar on Long Island.

Whereas the deHavilland in its original form landed at 60 mph and had a cruising speed of around 100, with the Bellanca modification it landed at 39 and cruised at 115.

The aeronautical world began to take notice of the young engineer, and in 1924 he was retained by the Wright Aeronautical Corp. to design a plane to demonstrate their newly developed air-cooled engine. This engine had been projected for the Navy, which began to use it almost exclusively, but it was considered too expensive for commercial and private planes. However, Wright decided to crack the civilian market. To this end a highly efficient plane was needed to point up all the desirable characteristics of the new power plant. Bellanca joined the Wrights and designed a plane around their engine. This was a high wing monoplane which gave promise of being a record breaker. Unfortunately, before it had a chance to strut its stuff, it was cracked up.

A second demonstration plane was built, and it won *all* the speed and efficiency contests at the Sesquicentennial Air Races at Philadelphia in 1926. Wright made plans for quantity production. However, the new air-cooled engine now was being accepted by commercial contractors, and the Wright organization decided that it was poor business to enter plane building competition with its own engine customers; consequently the project was given up.

Lindbergh Interested

About this time a young airmail pilot named Charles Lindbergh, having announced his plans to fly the Atlantic, made several trips east in an attempt to buy the Wright-Bellanca monoplane. The company was not interested, and Lindbergh's offer was refused.

In the meantime, Bellanca had left the company and joined Charles A. Levine to form the Columbia Aircraft Corp. In the belief that the plane should go along with its designer, the Wright Corp. sold the "140" to the new organization. Renamed the "Columbia" the craft was sent on an endurance flight. Piloted by Clarance Chamberlain and Bert Acosta, it established a non-stop refueling record of 51½ hours.

Sale of the "Columbia" to Bellanca and his associates opened the way for Lindbergh to renew negotiations. These were at first welcomed, so that it appeared for a time that the then unknown "Lone Eagle" would attempt the Atlantic flight in the Bellanca. Levine, however, decided against the sale and announced that he himself would sponsor the plane in a trans-Atlantic try.

So it was that Bellanca was forced to

Above are the U.S. Air Force's new "alert" hangars at O'Hare International Airport near Chicago. Two of the F-86 *Sabrejets* will be in the air within three minutes after the "scramble" siren sounds to track down the unknown aircraft. The other two planes remain on standby.

ALERT HANGARS

"Alert" hangars, now being erected at air defense installations throughout the country, are a new time-saving factor in air defense.

The new hangar is not unlike a firehouse in operation. Pilots sleep within a few feet of the aircraft and when the "scramble" siren sounds their jet interceptors can be airborne within three minutes.

Front and back doors of the hangars open wide in less than 30 seconds. This permits the pilot to start his jet engine in the hangar. The hangars are located at the end of the runway which has the prevailing wind, so that the planes can take off almost immediately after emerging.

Pilots estimate that the new hangars cut by two or three minutes the time formerly required to get the planes airborne.

Air Force officials express great satisfaction with the new hangars but stress the point that the hangars, like the jet interceptors and the pilots who fly them, depend for their effectiveness on civilian volunteers scanning the skies. Without adequate detection, which radar cannot provide at low level, the best time-saving equipment might well prove futile in the event of a showdown. Civilian participation in the Ground Observer Corps is the vital keystone in the nation's entire air defense program.

Front and back doors of the "alert" hangars open wide in 30 seconds.

see his ship kept from being first to fly non-stop to Europe. Less than a month after Lindbergh in his Ryan monoplane flew to fame, Clarence Chamberlain and Levine (as the first trans-Atlantic air passenger) flew the Bellanca across for a distance of 3,911 miles to Eisleben, Germany, for a new world's distance record. This flight did much to accelerate Bellanca's popularity and bring him the support he so badly needed . . . for by this time he had severed relations with Levine.

In 1927 the duPonts of Delaware decided to explore the field of aviation. When the fact became known, almost every aircraft manufacturer in the United States scurried to get their support. As is their custom, the duPonts were very deliberate. Finally, they announced their decision, and, to the great surprise of all, they rejected the proposals of several well-known aeronautical organizations and acceded to the demands of Giuseppe Bellanca. Although he still demanded that he alone have complete control of the policies of the concern, Bellanca became president of the organization with 51 per cent of the stock.

However, it was not very long before there was a clash of policies. Bellanca interested other bankers in his plane, and duPont was bought out. The control remained in Giuseppe's hands.

Bellanca with Byrd

Bellanca monoplanes were by this time becoming a familiar sight on the flying fields of the country. When Admiral Byrd drew up plans for his Antarctic trip, he specified a Bellanca monoplane. Although Henry Ford donated one of his tri-motors to the expedition an additional Bellanca was taken along.

Following the successful trans-Atlantic flight of the Bellanca "Columbia," another of Giuseppe's monoplanes, the "Pathfinder," was flown on a non-stop, round-trip flight to Bermuda. Then it was flown non-stop from Newfoundland to the Scilly Islands, England. In addition to this, the "Columbia" set a New York-to-California record and was used to make a record non-stop flight from New York to Havana. The old "Columbia" was the ship that made many aviators famous.

Giuseppe Bellanca saw his planes gain the unusual distinction of winning every contest or race in which they were entered. Thus his craft made much modern aviation history. In June, 1931, the Bellanca-built "Liberty" was flown from Newfoundland to Krefeld, Germany, and in July of the same year two Bellanca planes took off within an hour of each other on successful trans-Atlantic hops. The first ship, the "Cape Cod," flew 5,011 miles to Istanbul, Turkey, and the other, the "Miss Vedol," landed in England on the first leg of a successful 'round the world flight. This particular craft, piloted by Pangborn and Herndon, on the last leg of its journey made the first successful trans-Pacific flight, flying from Samishiro Beach, Japan, to Wenatchee, Washington.

Between 1932 and opening of the Second World War, Bellanca received several U. S. Government contracts and delivered planes to the Army, Navy, and the old Aeronautics Branch of the Department of Commerce. Sales of commercial versions of his planes were good during this period. During the war, the Bellanca organization made its contribution to the national defense by building components for such Army and Navy aircraft as the B-26, B-24, C-46, PBM-3, and others. Following the war the Bellanca plant built planes for the private-owner market and also engaged in development work. Presently the organization of which Giuseppe Bellanca is still president is building the "Cruisemaster," a four-place, low-wing monoplane for the private flyer.

Today the names Martin, Douglas, Lockheed, Boeing, Bell, Curtiss, Grumman and Sikorsky are in the news continually in connection with either military or civilian flying; the name Bellanca not so often. Yet the quiet little engineer will have a permanent place in aviation's Hall of Fame for his contributions to the advancement of aeronautical science and for his part in making flying simpler, cheaper, and more commonplace. END

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AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

CUBA

Another victory in AOPA's never-ending fight to make civil aviation more attractive, less expensive, and easier to use, is about to become a reality. It will be marked by a completely new set of rules and regulations governing the flight of U. S. private planes into and through Cuba—all of those rules designed by the Cuban government to cut charges and red tape to a bare minimum, or eliminate them entirely.

The new program has come about as the result of AOPA's long opposition to the policies of the previous Cuban government, under which U. S. pilots were charged outrageously high fees, and subjected to such a wide variety of restrictive regulations that AOPA felt it necessary to take steps to keep U. S. pilots out of that country. After numerous attempts to reconcile the problem with the administration then in power, AOPA notified all members to stay out of Cuba unless it was absolutely essential. Immediate result was virtually a boycott by AOPA members, nearly all of whom planned flights to other Latin American countries.

After that country's revolution in March, an entirely new government took over. One of the new government's officials is Dr. Antonio Perez Benitoa, director general of the Technical Offices of the Presidency, son-in-law of President Batista, and himself a private pilot. Also due much credit for solving the problem is Guillermo Alexander (AOPA 70778), a pilot and plane owner in Cuba who answered AOPA's plea for help from its Cuban members.

Several days of conferences between Cuban government officials, U. S. representatives (who were there only to set up a flight-plan notification service), and an AOPA official in Havana resulted in a whole new set of rules governing the flight of U. S. private planes in that country. Those rules now are in the process of being formalized and made into law. As soon as the Cuban government issues a decree making them official, AOPA will notify its members. AOPA also will have a supply of the official Cuban forms that will cover all the requirements of the various Cuban government agencies.

Among the changes contemplated by the Cubans are these:

Gas tax for private planes will be drastically cut.

The present expensive consular fees will be eliminated.

Customs brokers will be by-passed.

Landing fees will be eliminated.

The new form mentioned above will give the private pilot quick and efficient coverage of all Cuban government agencies.

Communications and flight-plan services will be free.

Flight throughout Cuba can be done freely, without the previous military restrictions.

The new notification flight-plan system being approved by the Cuban and U. S. governments will give both flight-plan service (which hasn't been available before), and automatic notification of customs, immigration and quarantine services.

Additional radio facilities will be installed in Cuban control towers, for private aircraft.

Cuban customs facilities and services will be available free seven days a week, from 0600 to 2400.

Meanwhile, arrangements are being completed to establish a new communications link between Miami and Havana for sending and receiving flight plans. An interim plan has been devised in which the facilities of ARINC (Aeronautical Radio, Inc.) in the U. S., and RACSA (Radio Aeronautica Cubana, S. A.) in Cuba are used. Both are private companies, owned largely by the airlines they serve. But both have agreed to help private flight plans free of charge until a permanent arrangement can be made between the two governments.

AOPA members are being kept posted on developments in the AOPA PILOT, and the monthly Confidential Newsletter.

DEADLINE FOR 3105

As the result of strong and widespread protests from users to the proposal to switch the old transmitting radio frequency from 3105 kc to 3023.5 kc on March 15, 1953, the Federal Communications Commission has announced that it will postpone that deadline one year, to March 15, 1954.

Meanwhile, the FCC also announced that the CAA will be prepared to give service on both 3105 and 3023.5 after March 15, 1953. On the 1954 deadline, 3105 will be finally dropped as an aviation frequency.

Many protests came as the result of AOPA's revelation that the changeover had been decided upon back in 1947, although the majority of persons affected by it had not known of it. AOPA learned of it only a few months ago, when final implementation plans were being laid.

3105 has been the standard transmitting frequency in the U. S. for many years, and also is widely used through the world for aeronautical communications. In requesting FCC to delay the changeover as long as possible, AOPA urged that the move not be taken until everyone had had ample time to make the change in all the equipment now using 3105, and until assurances have been received from all other countries in the Western Hemisphere that they too have completed the changeover. AOPA pointed out that, while VHF is becoming more and more common inside the U. S., the radio band in which 3105 kc lies still is almost universally used through the rest of the hemisphere.

ONE MEMBER DID IT

Individual AOPA members frequently are responsible for getting great and lasting results with their efforts. Take the Michigan member who recently dropped a note to National Headquarters after flying over to Chicago's lakefront airport on a business trip the other day.

He found that the newly-installed control tower there (operated by the city, not CAA) was only conducting VHF communications on 121.3 mc, a frequency they chose themselves. That meant that any plane wanting to communicate with that tower had to install a new crystal in his transmitter just for that field.

As soon as the member's report reached National Headquarters, an AOPA official contacted CAA officials in Washington. They expressed surprise, and immediately contacted regional CAA officials in Chicago to check on the report. The Chicago officials found that the people in charge of the city's control tower apparently had decided there was too much traffic on the standard frequency 122.5 mc, so they'd set up a special frequency of their own—121.3.

CAA officials quickly pointed out that the Federal Communications Commission requires that any such towers for civil public use must be equipped with the standard frequencies.

The tower at Chicago's lakefront field is now getting 122.5 mc.

WHO'S FLYING?

AOPA National Headquarters were recently encouraged by statistics compiled by all CAA control towers in the U. S., for 1951. Their statistics reveal that percentagewise, the year's over-17,000,000 plane movements were recorded as follows:

Airlines 27%
Other civil.....57%
Military 16%

PILOT PROTECTION

Answering many requests from members, AOPA's Washington counsel—Merrill Armour—has devised a new form to be used by pilots when carrying passengers free of charge. The form, to be signed by each passenger, is designed to protect the pilot from legal action in case of an accident.

The form is available to members, free on request.

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is "To make flying more useful, less expensive, safer and more fun."

Headquarters address is Box 5960, Washington 14, D.C. Members also receive a special AOPA edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

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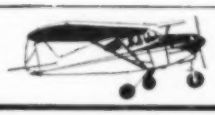

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Project Bumper

(Continued from page 32)

miles long. Ordinarily this great expanse of desert is big enough to ensure that rockets fired at White Sands fall back to Earth within the confines of the range.

But BUMPER was no ordinary rocket. By itself, the V-2 or lower stage could normally reach a height of slightly more than 100 miles, and the WAC CORPORAL could climb to at least 40 miles. Firing them together could be expected to result in an eventual CORPORAL altitude much greater than that of either one fired individually. For BUMPER, the White Sands Proving Ground, as immense as it is, was a small and difficult target.

Hitting this target was still further complicated by the rotation of the Earth. Calculations showed that the spinning of the Earth on its axis would shift the landing area's position in such a way that the CORPORAL would fall to the West of the desired impact point. To offset this, BUMPER had to be launched pointing slightly toward the East.

Many hours of pre-flight assembly in the shop area of the Proving Ground preceded the launching. Here, the CORPORAL and the V-2 were joined. Here, the separation mechanism, key to the successful in-flight launching of the upper stage, was checked and re-checked.

Upon completion of these preliminaries, BUMPER was ready to be taken to the launching area which, for safety reasons, is seven miles or more from the shop and cantonment area. The missile was loaded into the cradle of the *Meilerwagen*, a 50-foot long, 12-ton trailer used by the Germans to transport V-2's during the war, and the long slow ride to the firing site began. There, the *Meilerwagen* was secured in place, its cradle raised, the clamps released, and BUMPER was set into place on its launching platform. In this vertical position, the V-2/WAC CORPORAL assembly towered 60 feet in the air, taller than any previous type rocket.

Check and Double-Check

Preparations at the launching site were many. The V-2 and CORPORAL were examined in detail to ensure that they would function properly. The V-2 carried a radar beacon to present position information to radar tracking stations; it also contained a telemetering system to radio back performance information during flight. The CORPORAL carried a special receiver-transmitter radio system by which ground stations could determine its speed during flight. All such equipment, instrumentation, and circuitry had to be checked, calibrated, and adjusted.

Meanwhile, a firing date was established based on the estimated readiness of the missile and on the weather. A firing time —X-Hour—was also set.

As the hours, minutes, and seconds to X-Hour ticked away, there was much to do. The V-2 was fueled with liquid oxygen and ethyl alcohol, the CORPORAL with aniline and red fuming nitric acid. The launching site was cleared of all non-essential personnel and of all vehicles except firefighting and emergency equipment. U. S. Highway 70, which stretches diagonally across the firing range, was closed to traffic.

With X-Hour close at hand, operations became centered in a massive blockhouse a few yards from the firing site. In this structure with its reinforced concrete walls 10 feet thick and a roof 27 feet thick, the flight would be controlled. Here, the signal "FIRE" would be given.

First warning that BUMPER was about to be fired came at X-15 Minutes when a red smoke grenade was set off. This was followed by a final warning at X-2 Minutes in the form of a red star shell and the sounding of a siren. At 1514 (3:14 PM) Mountain Standard Time, BUMPER was fired.

The flight which followed was the highest rocket performance ever achieved. It began with a roar and burst of flame as the V-2 came to life. Then slowly, very slowly, the V-2 lifted itself and the CORPORAL off the ground. Quickly it began to accelerate. Sixty seconds after take-off, it was at a height of 20 miles and climbing at 3,000 miles per hour.

At this point, when the V-2 had about consumed its nine tons of fuel and had reached its maximum velocity, the upper stage was fired. Separating from the V-2 and enjoying the benefit of the V-2's altitude and speed, the CORPORAL went on to reach a height of 250 miles and speed of over 5,000 miles per hour.

Cameras, telescopes, radars, and radio equipment followed the CORPORAL during its climb to peak altitude. Comprising a vast network of instrumentation stations, this tracking equipment recorded the flight in terms of angles of elevation, angles of azimuth (horizontal bearing), and time. By comparing these records and reducing the data to useful form, the behavior and performance of the V-2 and WAC CORPORAL were determined.

From these tracking data, it was learned that the lower stage fell to Earth five minutes after take-off, the upper stage a little more than six minutes later. The V-2 was quickly found but the CORPORAL could not be located despite an intensive search. Eleven months later, in January 1950, a portion of the CORPORAL was finally recovered. The story of the highest rocket flight had ended.

Other WAC CORPORALs have been mounted on other V-2's. There have been other BUMPER firings both at White Sands and at the Long Range Proving Ground, Cape Canaveral, Florida. But the White Sands operation of February 24, 1949 is the most significant of all BUMPER firings if not the most significant of all rocket flights ever made.

This firing achieved the greatest altitude reached by anything made by man. But its true significance lies not in this record which can and eventually will be broken. Instead, its importance is the spectacular demonstration which it gave of the feasibility of the multi-stage rocket or the principle of firing one rocket from another in flight. If man is ever to fire a rocket to some interplanetary destination, he can do so only by using the multi-stage rocket. BUMPER showed that the stage rocket can be successfully designed, built, and flown—that space flight can become a reality instead of an unfulfilled dream. END

I Learned About Flying

(Continued from page 33)

and more frequent. By the time I was over Flint there was practically no snow whatsoever.

I had climbed to 2,000 feet and glanced over towards Bishop airport. No chance of landing there, though, with skis. To the right was the big city reservoir, a lake plenty long and wide enough to make a landing, and I swung over a bit—just in case. Then I noticed the gas gauge—it was considerably lower than it should have been for that distance. I recalled then that I had not checked the gas supply.

No snow for a landing below and I was skeptical of Flushing, where we had planned to land and have lunch. I began my let-down for Flushing, watching the terrain anxiously to see if there was any snow anywhere. There was not. The Dalton airport at Flushing was bare—and Sebewaing was 50 miles away, with a 20-mile headwind to buck. That gas gauge didn't look encouraging. Oh, why hadn't I gassed up back at Almont?

I climbed to about 2,000 and squared away for Sebewaing. I checked the compass course carefully and checked the section lines below—for in Michigan we watch section lines pretty closely to check our course. They run north and south and east and west, and are a mile apart.

Over Clio the gas gauge seemed to have hit bottom.

"Better not get off the course now," called my instructor encouragingly.

I was right on the course and I reached for the trim crank to trim her a bit more accurately so as to get maximum performance out of what little gas we had left.

Ten minutes later my instructor shouted back at me: "Get out over the Bay."

As I reached the shoreline, I felt just a bit better. I believe my instructor did too, for there was no chance of landing until we got over the ice.

When I spotted the smokestacks of Sebewaing, I breathed a sigh of relief. Believe me, I planned that landing carefully. I took no chance of overshooting and having to get around again. I landed just right.

We checked the gas. There was just barely enough for five minutes flight. Enough? Yes, but not enough for comfort. Never again will I take off on skis without making sure of a full tank of gas and of the condition of the terrain all along the way.

I have a lurking suspicion that my instructor, Frank Hofmeister, knew what he was doing when he never mentioned gassing up at our Almont stop. Anyway, he taught me one of the best lessons he had given me up to that time.

I learned something about flying from that.

END

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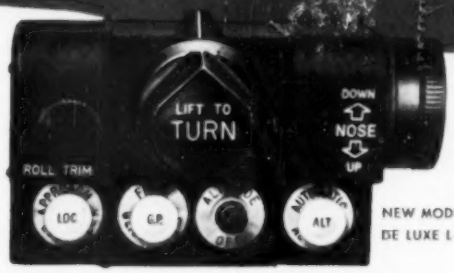

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